the OIL AND GAS JOURNAL

PUBLISHED WEEKLY SEPTEMBER 5, 1960

Exclusive PETROCHEMICAL-PLANT SURVEY indicates.....

"explosive growth for petrochem industry"

SURVEY ANALYSIS BEGINS p. 112

Superhighways: Growing marketing problem ▸ 89

Underwater crude-oil storage due first tests ▸ 92

Four new drilling tools make their bow ▸ 100

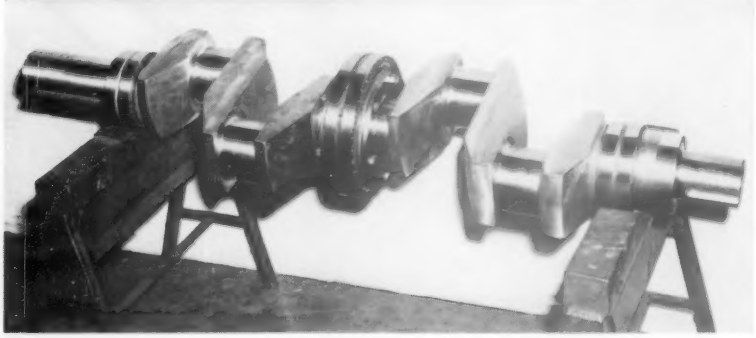
Well-casing corrosion due for mass attack ▸ 163

Nigeria prepares to market its oil ▸ 216

HIDDEN WORKERS KEEP COMPRESSOR GOING, GAS FLOWING

To keep this DPC 230 compressor working day and night—unattended—was one of the objectives of Ajax Iron Works engineers when they designed it. They had to have crankshaft bearings that would be long wearing, run "clean", and not trap any damaging foreign material. So they specified Timken® double row tapered roller bearings—"hidden workers" on the crankshaft ends and center position.

The hardened surfaces of Timken bearings virtually eliminate wear. And the natural pumping action of the bearing moves the oil fed to the center of each cup through the bearing. Foreign particles are flushed out. Assembly was simplified too, because the two separate cones of the center bearing permit slipping it over the crankshaft throws.



HELPING AJAX select the right Timken bearings for the compressor crankshaft (above) is typical of the service of Timken graduate sales engineers. Their engineering service can often solve bearing problems on the spot, save you time and money.

Industry rolls on

TIMKEN®

tapered roller bearings

The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO." *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.* Canadian Division: Canadian Timken, St. Thomas, Ont.

OIL AND GAS JOURNAL
Vol. 58, No. 36

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ANNUAL PETROCHEMICAL REPORT

Petrochemical Building Shows Big Surge 112

By Hugh S. Pylant

Petrochemical building is at an all-time high this year. Well over half of the newly announced projects, including building of new plants and new construction within existing plants, are to be located on the Gulf Coast. Major emphasis is on polyolefins, synthetic rubber, and styrene.

1960 Survey of Petrochemical Plants in the U. S. 116

By Robert B. Bizal

The Journal's eighth annual petrochemical survey has been expanded this year to include headquarter addresses of all companies. Here is the very latest and most complete plant-by-plant report, showing raw materials, capacities, and products. For easy reference to new projects, all construction projects are indicated with dot symbols.

World-Wide Survey of Petrochem Plants Outside U. S. 129

By Robert B. Bizal

New countries are being added as the world-wide petrochemical construction boom continues. This up-to-date report on all existing plants and planned projects outside the U. S. shows raw materials, products, and capacities. The report is alphabetized by countries and by companies.

Gas-Turbine Exhaust Fuels Waste-Heat Steam Generators 151

By C. P. Goforth and J. W. Hale

These three steam-generating units are used at the Lake Charles plant of Petroleum Chemicals, Inc. to utilize heat energy in gas-turbine exhaust gases.

Synthetic Ammonia—Biggest-Volume Petrochemical 158

This industry workhorse is made largely from synthetic gas obtained by partial oxidation of oil or steam reforming of natural gas.

Visual Evidence of How Catalysts Work 162

Technology—Operation

Well-Casing Corrosion Attacked in Fullerton Field 163

By Ed McGhee

The biggest anticorrosion program of its kind is now getting under way in this West Texas field. Electric power lines and rectifiers are being set to protect 529 active wells.

Refinery Cost Indexes 164

Oil-Well Pumping—13 169

By Joseph Zaba

Properties of sucker rods (continued).

Good Preplanning Means Drilling Savings 170

By Ed McGhee

Record made on two West Texas wells in reaching 9,100 ft. in 20 days with only 11 bits is due entirely to advance planning.

Hugoton Operators Shoot For Low-Cost Workovers 173

By R. M. Rippetoe and M. M. Sorenson

Many procedures have been tried in the past, but only a few have been economical. Continued high operating costs make low-priced recompletions a necessity, even with the current high demand for gas.

How a Small Refiner Uses Computers to Select Crude 176

By J. A. O'Neill, Jr. and C. B. Whyte, Jr.

Lease Tip: Portable Spray Pump Useful 179

Trunkline Will Use Turbine Centrifugals for Field Boosting 181

Safety in Hot Tapping Pipelines and Storage Tanks 183

By R. A. (Bob) Griffith

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Sept. 5, 1960

Petrochemical expansion has hit an all-time speed:

Oil industry throughout the free world is supporting mort than 300 projects at the present time.

Of these construction jobs, 118 are in the U. S. for such products as synthetic rubber, detergents, fibers, plastics, and fertilizers.

But the petrochemical industry is growing by leaps and bounds in western Europe also—90 new projects are going up there.

The industry, however, may be reaching maturity. Future growth rates will fall into line with the gross national product rate. Production in 1960 is expected to show a gain of 10.4% over 1959. The 1960-65 growth rate is expected to be about 8.7% (p. 112).*

Argentine Government is studying plans for a $74.5-million petrochemical complex proposed by five U. S. firms which will finance, build, and operate it.

Involved would be seven new plants, a new gas plant, and a 950-mile liquids pipeline (p. 108).

▼ ▼ ▼

Two financial deals are in the works:

...Anderson-Prichard is being split up. Its oil and gas properties will go to Union Texas Natural Gas and Frankfort Oil for $97.1 million. Refining, marketing, and transport facilities will go to a new firm, Apco Oil Corp. for $26.2 million (p. 91).

...Phillips and Sunray have swapped their extensive holdings in Canada to Pacific Petroleums for stock. This will give Phillips 39% ownership of the $315-million Canadian firm and Sunray 5.8% (p. 91).

Here's a switch in the way the oil business has been run for years.

The head of the crude-supply department of a major in-

---

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

tegrated company has laid down the law to the boss of the manufacturing department. He declared from now on the crude department will tell the refineries how much crude they'll get each month and what types.

Refinery operators in the past always have told their crude buyers how much and what type crude to supply—and crude buyers never talked back.

Crude buyers now generally believe the prorating states mean business in holding down production to force refiners to operate closer to the current demand rate. They think domestic crude supplies will stay tight for many months, forcing refiners to cut their garment to fit the cloth.

▼ ▼ ▼

Texas oil operators are in for some antitrust checking from the state attorney general.

The state agency confirms that it is investigating the jointly owned gas-processing plants in the state to see if they are doing more than extracting the condensate, natural gasoline, and LPG products from the gas.

Suit may be filed against any plant turning out liquids normally considered as products of refining. Basis of suits will be an old Texas law prohibiting joint ownership of refining facilities. This law was amended in 1953 to permit joint operation of gas-processing plants but prohibited such plants from engaging in refining.

The state antitrust sleuths reportedly were alerted to possible violations by an independent refiner who feared the adverse effects of "gasoline-plant refining" on the product markets.

Underwater storage is getting a real test in the Louisiana offshore region.

Three projects are planned: A 20,000-bbl. unit by Bethlehem Steel, a 15,000-bbl. unit by Higgins Co., and a 50,000-gal. rubber container by U. S. Rubber Co. (p. 92).

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Chances for a price rise in steel used by the oil industry are very dim, according to steel-industry reports. In fact, steel men are having trouble holding the line on their present prices in view of current demand.

The outlook: Only a drastic change in the steel market could result in any price increase this year. Chances are a general change in steel prices won't come until later in 1961.

A steel maker reportedly is considering a change in its system of inspecting casing before it leaves the mill. X-ray inspection may replace the present visual check.

Behind the talk is concern over the amount of defective pipe being turned up after shipment to the site by outside

inspection services. This is expensive to the manufacturer who must issue credit for defective pipe and also pay the freight charges.

A new 30-in. gas-transmission line will soon tap one of the world's great natural-gas reserves.

Work is starting this month on a line from Fort Nelson area to Fort St. John, B. C., terminus of Westcoast Transmission line to Vancouver (p. 99).

▼ ▼ ▼

The ODM is considering requiring periodical price reports on residual fuel oil. It would be the government's first portwar step toward oil price controls even though it might not intervene in actual pricing (p. 94).

The universal credit card apparently is dead for the moment. Marketers found too many objections.

Among them: It wouldn't save money, but would add to costs in many cases...Company would lose control over credit approval...Company would lose its credit-card identity...The business is too big for one company to handle satisfactorily.

Other marketing notes: Octane number of regular went up again in August while that of premium declined (p. 93)... Pauley Petroleum has moved into the retail gasoline marketing business in California (p. 106)...The surplus in the highway trust fund showed an $8.1-million increase in July. Total of the fund now is $127 million.

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The Washington beat:

Visit of Russian oil experts to U. S. is being planned for October. They will tour refineries, oil-field installations, research labs. Meanwhile, some members of the U. S. delegation that toured Russia are now back in the states, others are making side trips to other countries.

FTC may make changes in antimonopoly case procedure. Under consideration: Possibility of letting a company voluntarily agree to discontinue practices FTC considers might be violations. This, in some cases, would replace current formal charges and lengthy hearings.

Robert Bicks may be nearing the end of brief, aggressive career as assistant attorney general in charge of antitrust cases—even if the Republicans win in November. A Senate subcommittee refused to confirm his appointment to the job which he held in an acting capacity for more than a year.

Indonesia is making nationalizing threats at Royal Dutch-Shell, the country's oldest oil producer and second largest. Parliament formally urged President Sukarno to confiscate all property remaining in Dutch hands.

Market Memo

Sept. 5, 1960

The markets are marking time. Labor Day, the turning point for seasonal demand changes, finds light products in excess supply but prices currently steady.

Refiners are on a price spot. Crude is tight and will remain so well into October. They thus are reluctant to follow the usual pattern of autumn discounts on gasoline.

Reduced crude supply may force lower crude runs through October. This would encourage inter-refinery product trading with the result of improved balance between supply and demand.

The general price picture: Distillate fuels are firm. No flagrant price discounts have been spotted either on distillates or gasoline. Crude is as firm as it's been in months. This is reflected in the Illinois basin, Michigan, Kentucky, and Ohio price boosts.

Gulf Coast markets are steady. Quotations for 92-RON gasoline in cargo lots are at posted price of 11.25 cents per gallon with no cargoes pushing the market.

No. 2 is firm at 8.25 cents posted price, closely held with seasonal price improvement expected. Bunker C fuel is strong at $2.30 per barrel and avidly sought at that price.

The Chicago gasoline market is showing symptoms of weakness with reports of discounts. They still are not as prevalent as in the past. Chicago posted prices remain unchanged with 92-RON posted at 12.625 cents and 99-RON at 15 cents.

No. 1, posted at 10.25 cents, and No. 2 at 9.50 cents are in a static position, awaiting pickup in seasonal demand.

On the Mississippi, products are not pushing. Refiners are in an inventory position that allows them to wait until after Labor Day before considering abnormal discounts. No. 2 is being held for one-quarter cent over Gulf Coast low.

In the Midwest, middle distillates are holding firm at posted prices of 10 and 9 cents respectively for No. 1 and No. 2. Inquiries for No. 2 continue in the market place, but sellers are not in a mood to discount.

Gasoline out of Group 3 for northern shipment, while considered firm at present posted prices of 12.50 cents for 91-RON and 15.25 cents for 99-RON, is being quietly discounted by only a few suppliers.

Good Wells Make Good News

A Report on Recent Fast Payout Acid Jobs

September 5, 1960

Here are four recent Dowell acidizing treatments that gave unusually fast payouts —increasing net profits to operators.

- **Midland County, West Texas** (New Gas Well) This Devonian well was completed through two sets of perforations between 11,456 and 11,542 feet. Production before treatment was only a small amount of distillate. Dowell injected 75,000 gallons of a special Retarded Acid, spearheaded by 3000 gallons Mud Acid. The Retarded Acid was injected at the high rate of 40 bpm and 5000 psi. After treatment, well tested 6800 mcfd with about 2000 barrels of distillate. Payout was unusually fast despite large size of treatment.

- **Chambers County, Southeast Texas** (Old Oil Well) This well had been completed through a screen liner between 5415 and 5449 feet. Production had declined to zero because of calcium carbonate deposits on the screen. Dowell used 500 gallons regular acid with a surfactant added. The acid was put on bottom and allowed to soak for 30 minutes; then it was squeezed into the pay. Production rose to 50 bopd. The $335.00 treatment paid out in about four days.

- **Ellis County, Kansas** (New Oil Well) This well gave no production before treatment. It had been completed through perforations into the Kansas City-Lansing between 3270 and 3281 feet. Dowell recommended 2000 gallons Retarded Acid (acid-oil emulsion type). A spearhead of 500 gallons regular acid with surface tension reducing agent was used. Treatment was down tubing at 2 bpm. After load was returned, well tested 14.65 boph — nearly three times that of similar offset wells. $881 treatment paid out in less than 15 days.

- **San Juan County, Utah** (Old Oil Well) Production had declined from an original 225 bopd to 34 bopd. Completion was in the Desert Creek zone of the Paradox at about 5600 feet. Previous treatments on similar wells in the area, using regular acid and high injection rates, had broken through to water or given unprofitable production increases. Dowell used 4000 gallons Retarded Acid spearheaded by 1000 gallons regular acid with addition agents to reduce surface tension and prevent emulsions. Injection rate was 5 bpm. Production rose to 450 bopd, and treatment costs were paid out in less than four days.

Anyway you look at it, the question is: "Can you afford not to take advantage of Dowell acidizing?" Get the facts from a Dowell representative. Chances are good that he can tailor an acid treatment to solve your production problem and increase your profits. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina and Germany. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

Centrifugal or Reciprocating?

Specify Wilson-Snyder

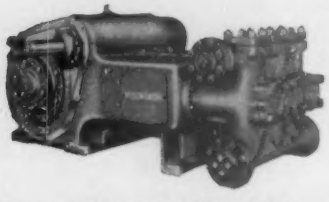
. . . and KNOW you are getting the type of pump that is BEST for your refinery applications

Since 1878, the Wilson-Snyder trade name has been synonymous with the highest quality in heavy-duty pumps. Their performance records in thousands of refinery installations throughout the United States and in foreign countries have established them as the industry's finest pumps.

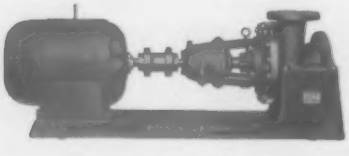
While centrifugal pumps are widely used for process work, there are specific applications for which reciprocating pumps offer definite advantages from the standpoint of both performance and economy.

As a manufacturer of both centrifugal and reciprocating types (including both power-driven and direct-acting steam-driven), you can be sure our unbiased recommendation will be the type best suited for your specific applications.

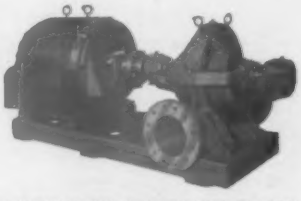
Here are Four Popular Types



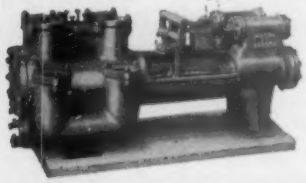
TRIPLEX PLUNGER-TYPE POWER PUMPS . . . Designed for handling a wide range of products, including highly volatile liquids over a wide temperature range, and time-proven in high-pressure charge pump service. Available in 4", 6" and 8" stroke sizes for capacity requirements up to 500 GPM and pressures up to 5,650 psi.



ES CENTRIFUGAL PROCESS PUMPS . . . Single or two-stage heavy-duty type for elevated temperature applications to 900°F., employing vertically split case and single stuffing box for conventional packing or mechanical seal of your choice. End suction, as illustrated, is standard construction—can also be furnished with top suction when preferred. Twenty sizes provide capacities from 15 to 2,000 GPM, 50 to 1100-ft. head, 2 to 250 HP.



DOUBLE SUCTION CENTRIFUGAL PUMPS . . . Single-stage heavy-duty type for temperature applications to 300°F., employing horizontally split case with impeller mounted between bearings. Side suction and side discharge arrangement is standard—bottom suction arrangement is available in 14" and larger sizes. Fourteen sizes provide capacities from 100 to 30,000 GPM, 20 to 300-ft. head, 5 to 1,500 HP.



DUPLEX PISTON-TYPE DIRECT-ACTING STEAM PUMPS . . . Designed for handling a wide range of products for all general service requirements, including the handling of volatile liquids over a wide temperature and pressure range. Available in stroke lengths from 6" to 24" for capacity requirements to 1800 GPM and pressures to 800 psi.

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. . . on Wilson-Snyder Process Pumps can be secured through your nearest "Oilwell" Branch . . . or direct from WILSON-SNYDER SALES ENGINEERS at . . . Chicago, Illinois . . . Dallas, Texas . . . Houston, Texas . . . Los Angeles, California . . . New York, N. Y. . . . Tulsa, Oklahoma . . . Pittsburgh, Pa. Wilson-Snyder Works, Braddock, Pa.

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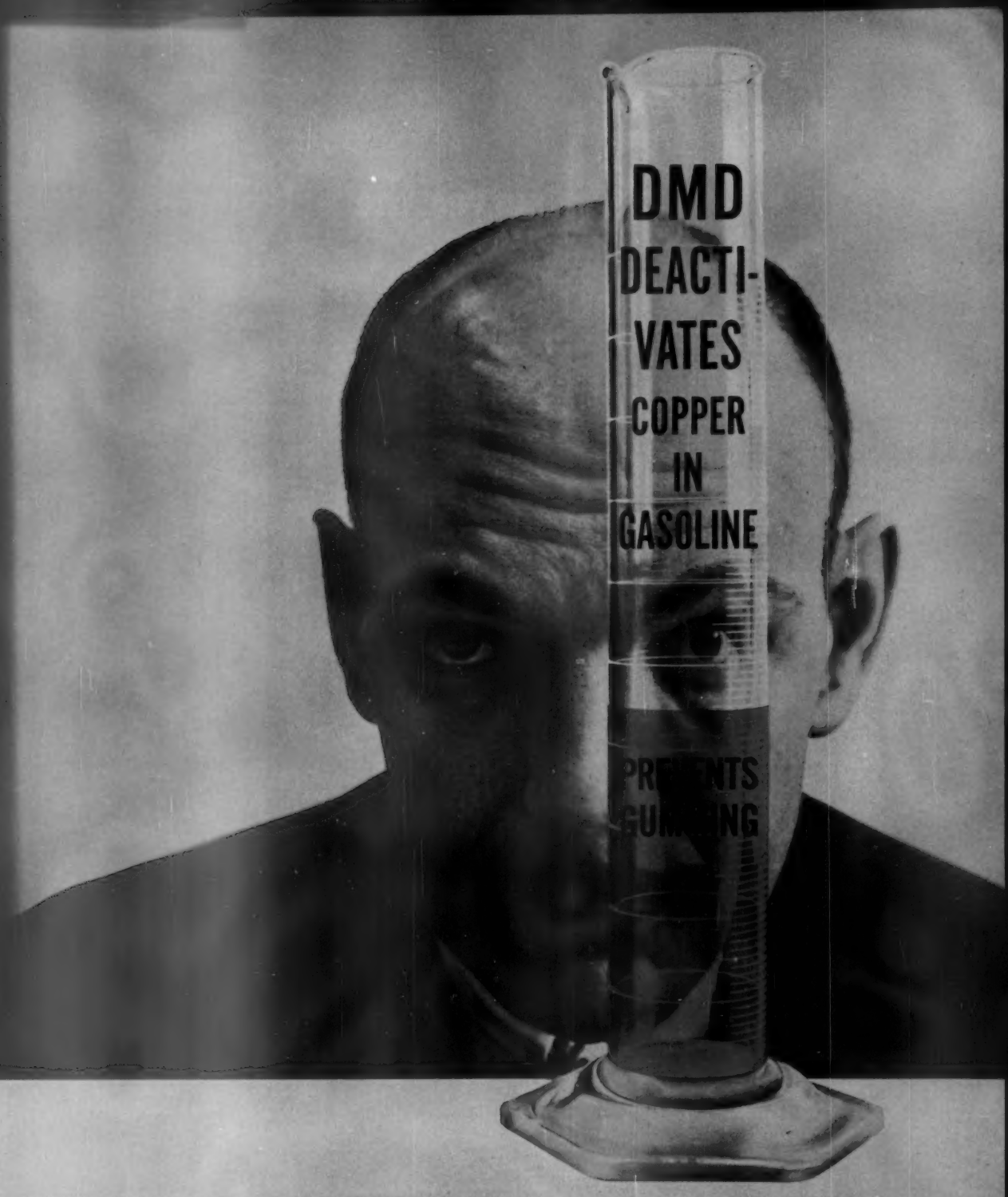
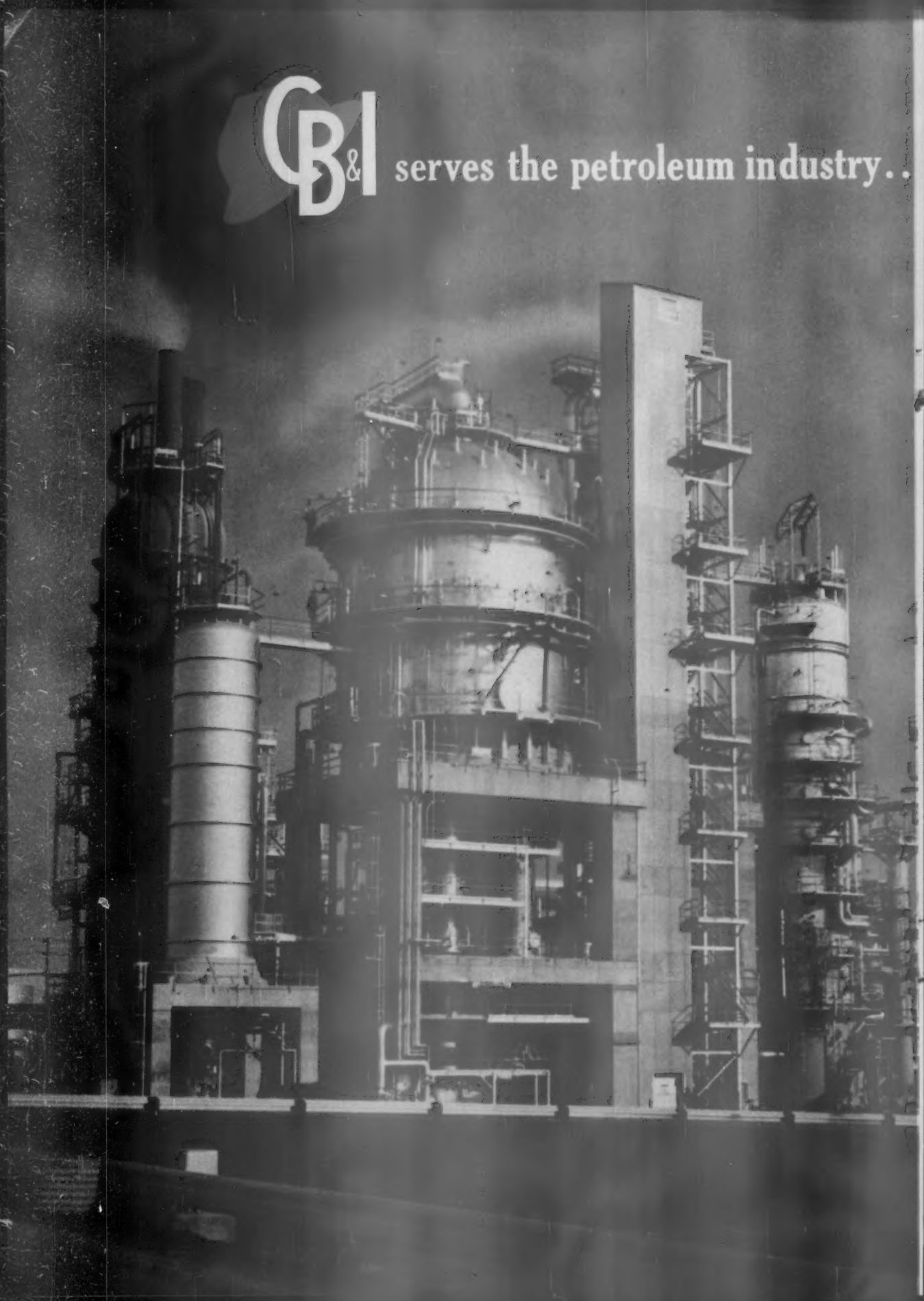


HERE IS ENOUGH (3 ounces) Du Pont Metal Deactivator to prevent copper-caused gumming in 8000 gallons of gasoline. ■ Somewhere, somehow, nearly every gallon of the gasoline, kerosine, jet or diesel fuel you produce will come in contact with at least a tiny bit of copper. Can't be helped. ■ By adding DMD to the fuel, you convert any dissolved copper into harmless chelate complexes. Result? No gum, no loss of product quality, no complaints. ■ This additive, which Du Pont pioneered 20 years ago, is still the best metal deactivator known to petroleum science. And as you can see, a little goes a long way. Figure the economics for yourself, or ask us to. ■ E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

DU PONT

DU PONT TETRAETHYL LEAD and OTHER PETROLEUM ADDITIVES

Better Things for Better Living . . . *through Chemistry*


CB&I
serves the petroleum industry..

processing structures

CB&I offers a single source and responsibility for the engineering, fabrication and erection of petroleum processing structures. These *coordinated services* are the reason why leading refiners rely again and again on CB&I for efficient equipment necessary to their operations.

If *you* demand imaginative engineering . . . strict metallurgical control . . . careful customizing of structure to *process* . . . place your confidence in CB&I.

tanks for storage

CB&I has grown up with the petroleum industry, always striving to develop better methods of storage. Thousands upon thousands of CB&I-built storage and process vessels serving refineries throughout the world prove our capabilities are second to none.

Every CB&I structure is backed by experience gained from more than seven decades devoted to *Craftsmanship in Steel*. Write for additional information.

Left—Catalytic cracking unit at a Pacific Northwest refinery. The reactor, regenerator, catalyst hoppers and fractionator were built by CB&I and furnished through Bechtel Corporation.

Above—The wide variety of CB&I-built structures meet almost any storage need . . . for high or low pressure, in gas or liquid form.

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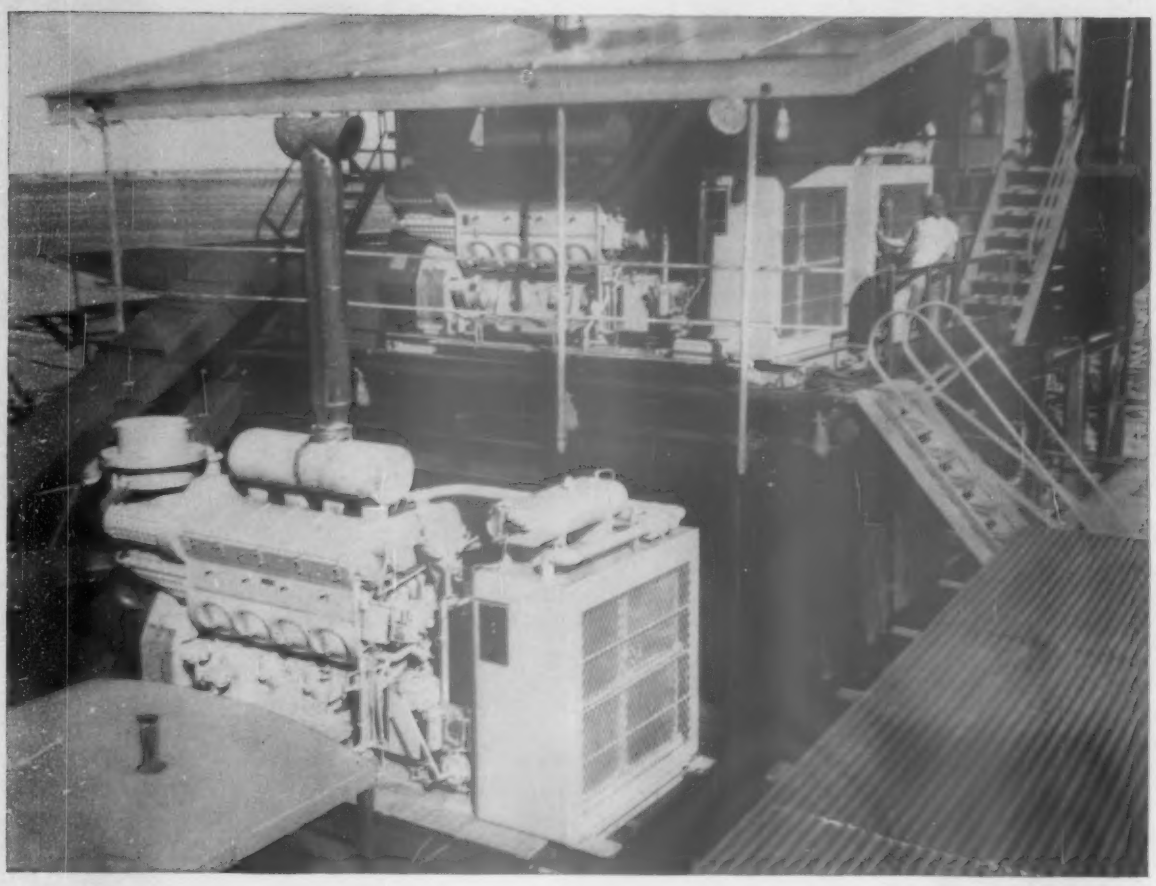
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

P97SCB



Electro-Motive engines drive Penrod's deep-drilling rig

First application of two 1000-hp Diesels on mechanical rig

Penrod Drilling Company's Rig 15 is one of the biggest mechanical rigs in deep-drilling capacity —25,000 feet. Yet, it accomplishes this with just *two* normally aspirated Electro-Motive Diesel engines on the draw works.

One of the rig's two mud pumps is V-belt driven off the rear of the engine compound and the second is driven by a separate Electro-Motive skid-mounted with the pump.

Penrod's choice of Electro-Motive Power for the big rig was based on three factors:

Economy of operation

—two Electro-Motive Diesels cost less to run than a multi-engine compound of similar horsepower, plus reducing maintenance with fewer engines to service.

Fast rig-up and take down

—with only two engines, mobility, efficiency and economy of transportation are provided. At its present location, Rig 15 was set up in two days and drilling began the morning of the *third* day.

Dependability

—although this is the first application of Electro-Motive Power coupled directly to the draw works of a rig, these engines have powered generators on electric rigs for many years. Their performance, reliability and low maintenance have been instrumental in setting a number of drilling records.

This is just another example of Electro-Motive Power; Power that is designed, built and backed by *one* manufacturer. See your Electro-Motive representative—ask about this versatile power for economical drilling and pumping operations.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · LA GRANGE, ILLINOIS

In Canada: General Motors Diesel Limited, London, Ontario
Petroleum Industry Sales Offices: Houston, Texas.

WITHOUT ADEQUATE PROTECTION, this spectacular tank fire spread wildly and caused many thousands of dollars of refinery property damage.

Keep tank fires from getting out of control with Grinnell Water Spray

Proper safeguards are uppermost in importance in protecting tanks which contain flammable gases and liquids in the event of fire. For example, tanks must be guarded against extreme heat exposure. Leaking gas, if it should develop, must be diluted to the point where it will not burn. And fire, if it should occur, must be localized and controlled or extinguished.

With a Grinnell Water Spray System, you get such protection.

Before heat raises tank temperatures dangerously, an enveloping spray of water provides instant cooling, reducing internal pressure which helps prevent rupture. In addition, air turbulence is created (even in still air) which, in conjunction with the water vapor from the spray, helps dilute the flammable vapors to control or extinguish the fire. Flammable products which cannot be safely extinguished can be safely burned off under the protecting water spray.

FREE REFERENCE MANUAL. For a comprehensive picture of all the most advanced methods of special hazard fire protection, request your free copy of "Special Hazard Fire Protection by Grinnell." Write Grinnell Company, Providence 1, R. I. Branches in principal cities.

GRINNELL WATER SPRAY SYSTEM under test at the Marietta, Ohio plant of the Bakelite Union Carbide Plastic Company, a division of the Union Carbide Corporation. Water — when it is applied in time and distributed over the surfaces efficiently by a properly engineered system — is most effective in limiting tank fires and controlling their spread.

GRINNELL

FIRE PROTECTION SYSTEMS SINCE 1870

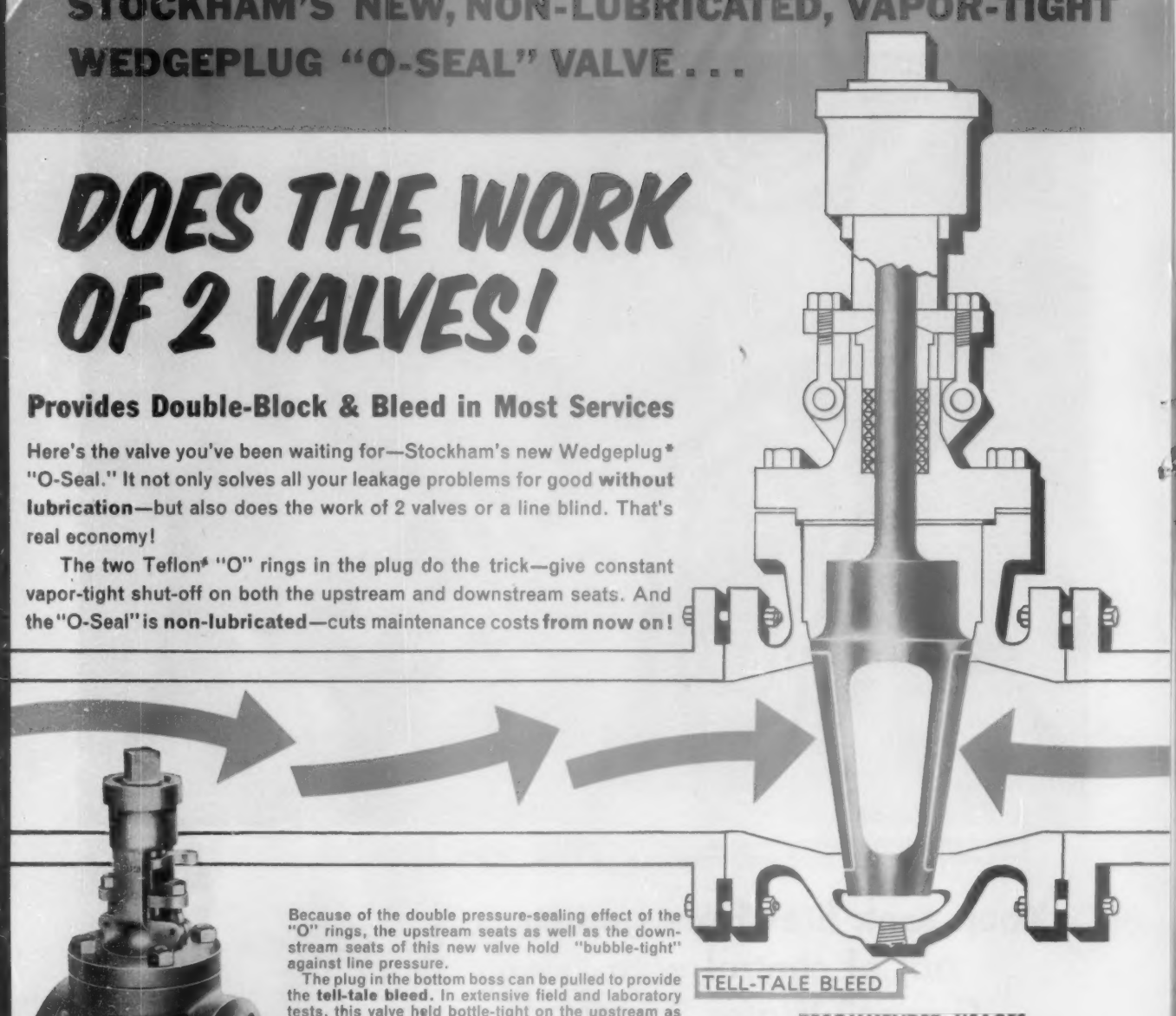
STOCKHAM'S NEW, NON-LUBRICATED, VAPOR-TIGHT WEDGEPLUG "O-SEAL" VALVE . . .

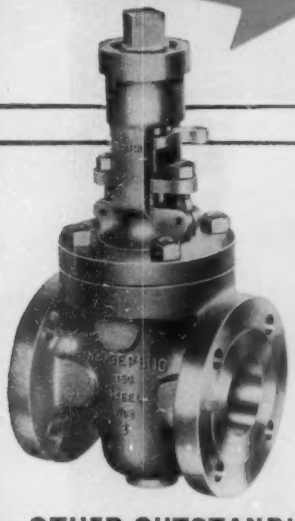
DOES THE WORK OF 2 VALVES!

Provides Double-Block & Bleed in Most Services

Here's the valve you've been waiting for—Stockham's new Wedgeplug* "O-Seal." It not only solves all your leakage problems for good **without lubrication**—but also does the work of 2 valves or a line blind. That's real economy!

The two Teflon# "O" rings in the plug do the trick—give constant vapor-tight shut-off on both the upstream and downstream seats. And the "O-Seal" is **non-lubricated**—cuts maintenance costs **from now on!**





Because of the double pressure-sealing effect of the "O" rings, the upstream seats as well as the downstream seats of this new valve hold "bubble-tight" against line pressure.

The plug in the bottom boss can be pulled to provide the **tell-tale bleed.** In extensive field and laboratory tests, this valve held bottle-tight on the upstream as well as the downstream seats when the bottom plug was removed. There is absolutely no mixing of products in manifolds.

Thus the "O-Seal" can do the job of two ordinary valves or a line blind in most services.

Your Stockham representative will advise you about the recommended services for the "O-Seal's" double-block and bleed feature.

RECOMMENDED USAGES

Stockham's new "O-Seal" is recommended for all general services—air, gas, water, steam, propane, hydrocarbons, etc., as well as for hard-to-hold services. Recommended for temperatures from minus 300° F. to plus 400° F. and not exceeding 720 psi.

Available in carbon and alloy steels, 2"-12" sizes, 150 and 300 lb. pressures. Three port openings—40%, 70%, full round-wrench, handwheel, gear, and motor operated.

OTHER OUTSTANDING ADVANTAGES — **Non-Lubricated—no costly maintenance necessary • Absolute shut-off that remains permanently "bubble tight" • Quick, easy operation—won't stick—ever • Double Seating for Double Safety—Ground metal-to-metal seat provides shut-off in case fire burns out "O" rings • No Product Contamination-Protected Seats.**

*Patented
#Teflon: Dupont Trademark

STOCKHAM'S NEW WEDGEPLUG "O-SEAL" VALVE

Call your **STOCKHAM Distributor or Sales Representative** for complete details, or write today for the new brochure on the Wedgeplug "O-Seal."

Stockham makes a *better* valve . . . for *every* job

WEDGEPLUG VALVE COMPANY *Division of* → **STOCKHAM VALVES *and* FITTINGS**

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CAST IRON—MALLEABLE PIPE FITTINGS • BRONZE, CAST IRON, DUCTILE IRON, CAST AND FORGED STEEL VALVES

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Begin programming your next fracturing treatment by calling in a Halliburton man. He will supply sound, seasoned advice to assist you in making profit-wise decisions.

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Is it better to reduce friction loss or add more horsepower? Your Halliburton man is trained in showing you the alternatives with which to design your fracturing job. Let him point out the comparative advantages of fluids, additives and horsepower to help you select the best, most economical fracturing treatment for your well.

BE SURE YOU GET THE **ENTIRE** *FRACTURING STORY . . . CALL* **HALLIBURTON FIRST!**

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- Enhances action of other additives, such as copper deactivator
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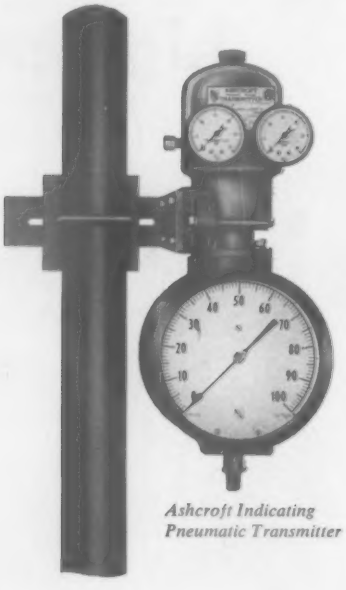
signal

ASHCROFT PNEUMATIC TRANSMITTERS give you a true primary and transmitted signal for indication or control



Ashcroft Indicating Pneumatic Transmitter

action

Now—detect with precision accuracy the slightest change in primary pressure or temperature. Transmit this signal quickly to your indicators or controllers. Ashcroft Pneumatic Transmitters achieve these results for you at the lowest initial and operating costs.

Full-range, solid-front indicating and totally accessible nonindicating transmitters eliminate the need for costly high pressure lines, yet permit complete monitoring of process conditions in remote areas.

Narrow-span Ashcroft Transmitters are expressly designed with highest sensitivity and repeatability for the most accurate primary signal feed to controllers. You get better control and purer, lower-cost final products.

Only in Ashcroft Pneumatic Transmitters can you get the wide choice of Ashcroft Duragauge Bourdon tubes or American mercury or gas-actuated systems for sensing pressure or temperature conditions. You also get a time-proven, obstruction-proof, force-balance, nonbleed relay for economical, maintenance-free 3-15 psi or 3-27 psi signal transmission.

Write for factful Bulletins 360 and 361 or ask your nearby Ashcroft Distributor to help you select the right transmitters and receiver gauges for your specific requirements.

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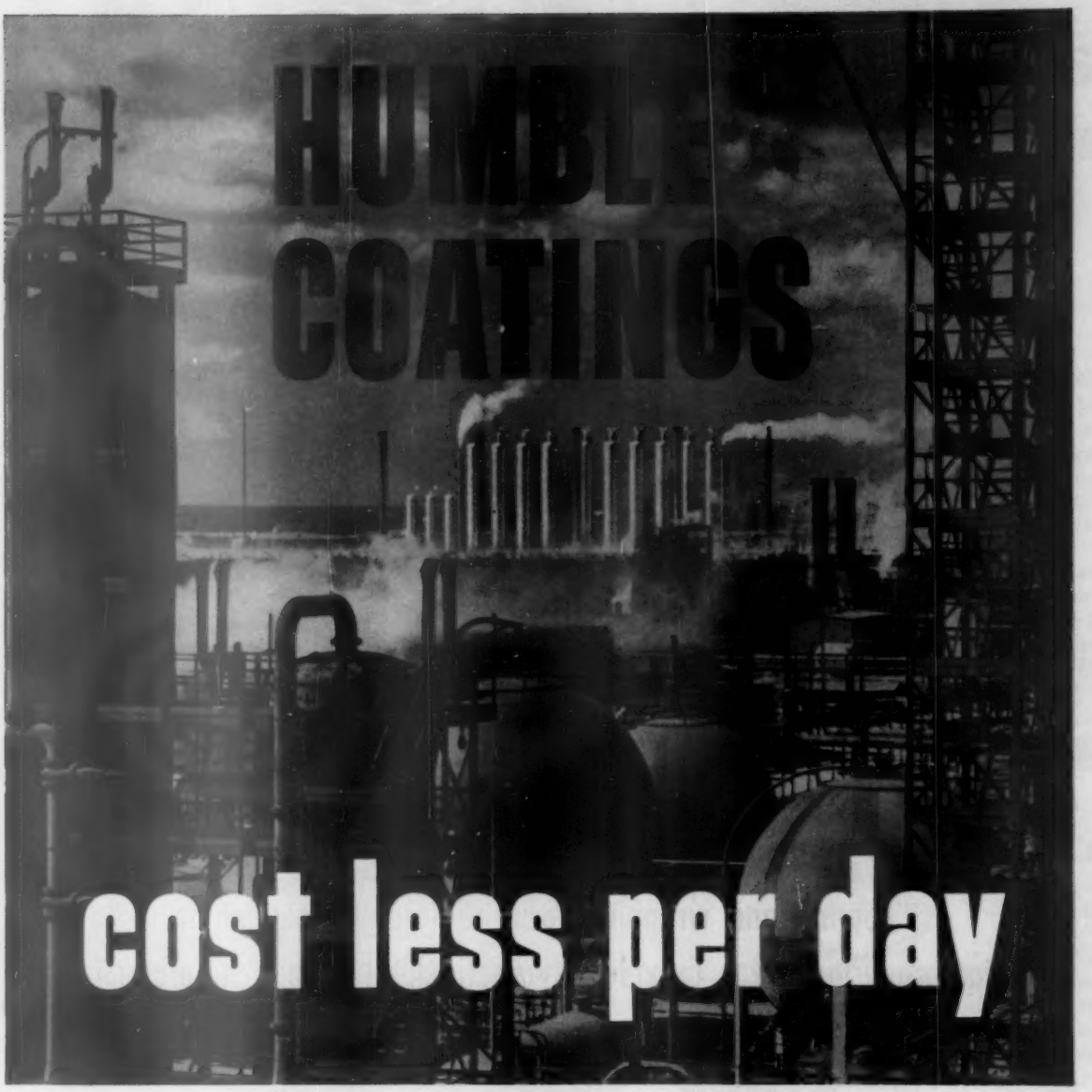
ASHCROFT PNEUMATIC TRANSMITTERS

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario



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For more information on Humble's complete line of paints and protective coatings call your Humble salesman, or contact Humble Oil & Refining Company, Houston, Texas.

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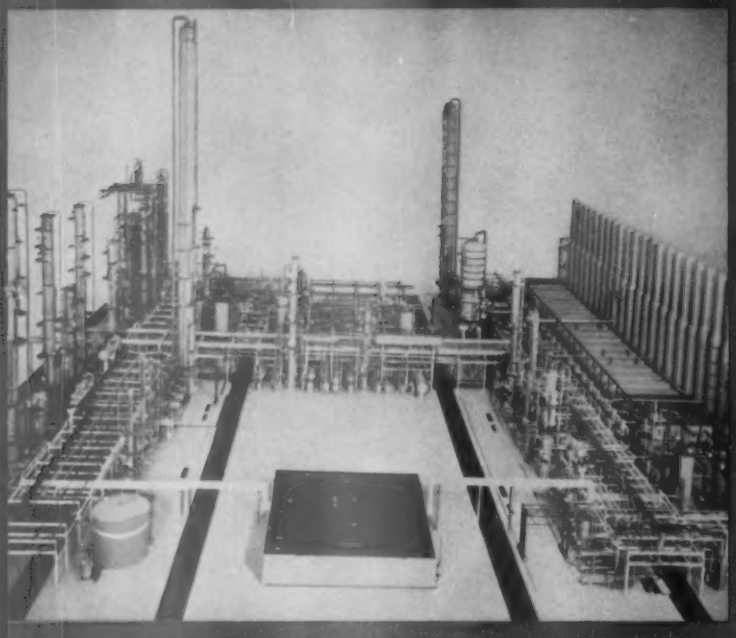
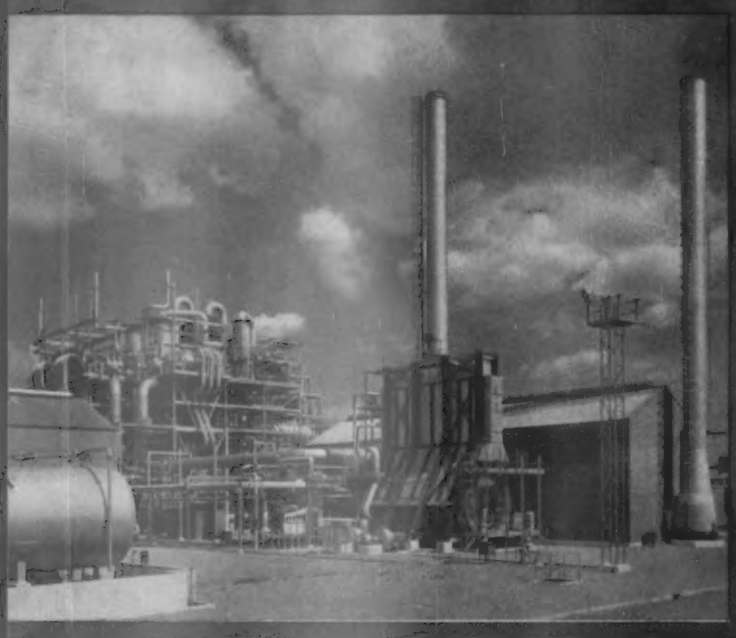
Kellogg Engineers and Builds World's Biggest Olefin Plants



Mobil

FUTURE WORLD'S LARGEST is Socony Mobil Oil Company's ethylene plant at Beaumont, Texas. It is the first large plant in the U.S. to crack naphtha into olefins. Engineered by The M. W. Kellogg Company, as shown in this scale model, it is scheduled for completion by Kellogg by 1961. Capacity will be 380 million pounds annually of 99.9% purity ethylene.

This newest plant consists of steam pyrolysis, gas treating, and product recovery sections. It has been designed to handle simultaneously both liquid and gaseous feedstocks. In addition to ethylene, major products will include propylene, propane, a B-B product, gasoline, and fuel oil.



ICI

LARGEST OUTSIDE THE U.S. is the English Wilton Works of Imperial Chemical Industries, which now includes three olefin plants. Photograph shows Plant No. 3. All are the result of close engineering cooperation between Kellogg and I.C.I. Together, they represent a current output of 110,000 tons per year of high-purity ethylene, and a potential of 140,000 tons.

Plant No. 1, commissioned in 1951, was the first full-scale adoption of the then novel process of oil pyrolysis developed in Kellogg's laboratories. Its success led to the addition of Plant No. 2 in 1956, and then to No. 3—representing a 60% increase in olefin capacity—in 1959.

Whether your approach to ethylene is through the steam pyrolysis of hydrocarbons or the recovery of ethylene from gas mixtures, Kellogg has developed processes which can assure the optimum investment, operating costs, product purity, and yield. For more information about Kellogg's 2-billion-pound background in engineering and/or building ethylene plants, write for a copy of "Olefin Plants" Kelloggram.

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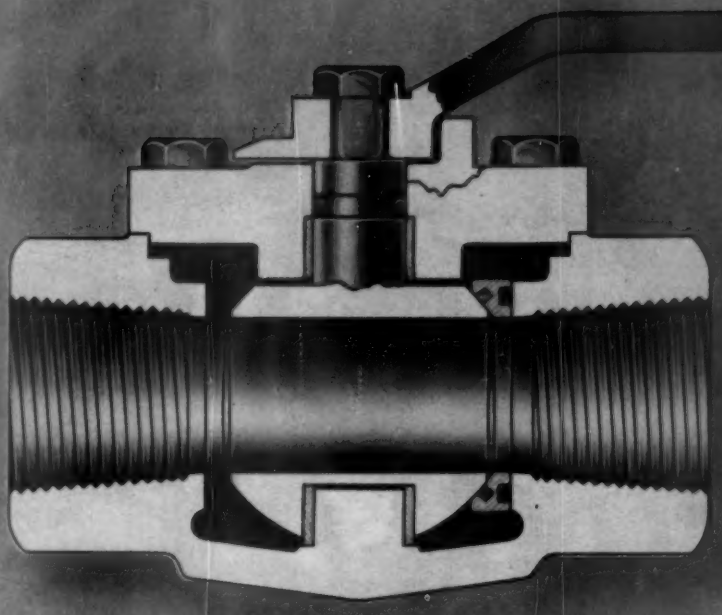
...how can 1 valve replace 3?



Better **FLOW** than a **GATE**...

but, unlike gates, the *FLO•BALL* valve doesn't freeze or jam . . . it never leaks . . . the seats don't score . . . it requires no maintenance . . . and just a ¼ turn opens or closes it.

Better **SEALING** than a **GLOBE**...

but, unlike globes, *FLO•BALL* gives zero leakage . . . in both directions *without* seat distortion . . . closes easily without massive operators . . . gives more than twice the flow . . . and the fastest action of any valve made.

Better **RELIABILITY** than a **PLUG**...

but, unlike plugs, *FLO•BALL never* needs lubrication . . . never freezes, never leaks, requires no maintenance . . . yet it has greater flow capacity than any plug . . . and the *lowest* torque in the industry.

FLO•BALL® does it...and does it better!

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FLO-BALL

Mail this postage-free card today!

Bearing-fixed ***FLO•BALL*** valves are stocked with flanged or screwed ends, full or reduced port, in standard sizes from ⅛" to 10". They are made to standard ASA dimensions in carbon steel and 316 stainless steel.

Gentlemen:

Perhaps your bearing-fixed ***FLO•BALL*** valves can fill my applications. I require valves

for_____.

_____ in these sizes_____.

I now use ball valves in these sizes_____.

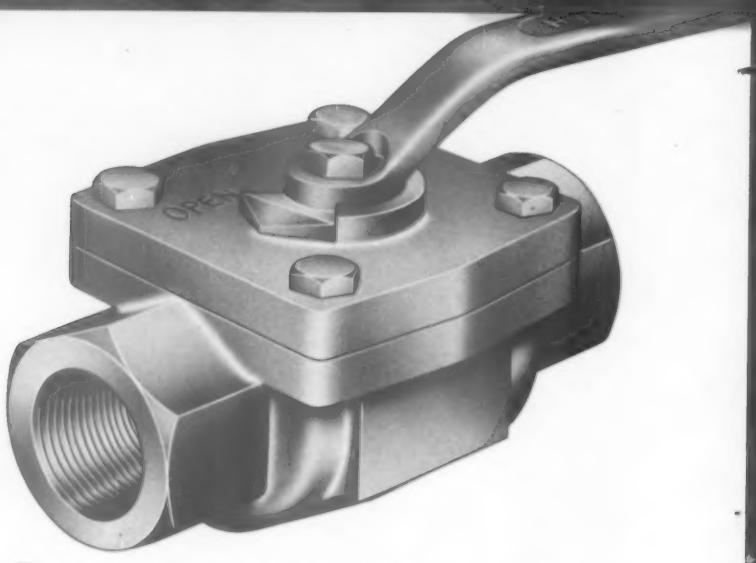
PLEASE: ☐ Have salesman call ☐ Send technical data

My name_____ Position_____

Company name_____

Address_____

City_____ State_____



...how the FLO•BALL® reduces your valve costs 3 ways!

1. Reduce initial costs . . . *by using fewer valves per system. FLO•BALL valves are used in place of gates, globes, or plugs.*

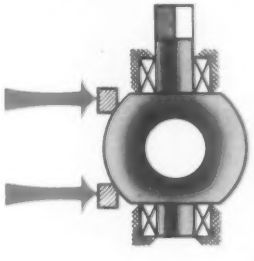
2. Reduce inventory costs . . . *by standardizing on one type valve for all applications requiring gates, globes, or plugs.*

3. Reduce maintenance costs . . . *the FLO•BALL high reliability means less maintenance . . . no lubrication, no freezing, positive sealing. The top loading and replaceable seat reduces overhaul and start-up costs.*

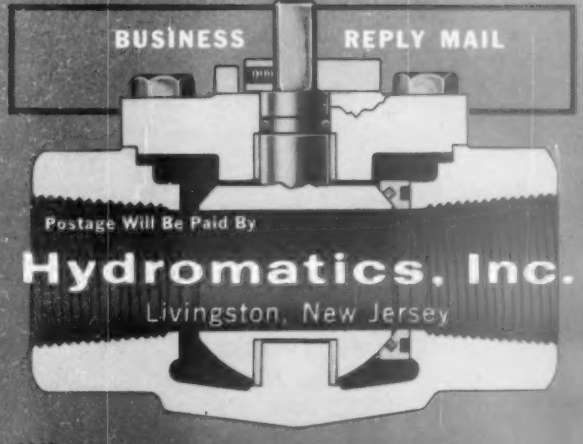
Principles of Operation

In the bearing-fixed FLO•BALL valve all pressure forces exerted on the ball are transmitted to low-friction bearings. The pressure balanced seat results in a sealing force which is designed to insure positive sealing without seat distortion, and to minimize seat-resisting frictional forces. The combination of these low frictional forces accounts for the extremely low operating torque.

FLO•BALL VALVE
Fixes ball • Floats seat



BUSINESS REPLY MAIL



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Ask your dealer to explain how Eaton 2-Speed Axles reduce hauling costs, add to profits, and make trucks worth more on the trade-in.

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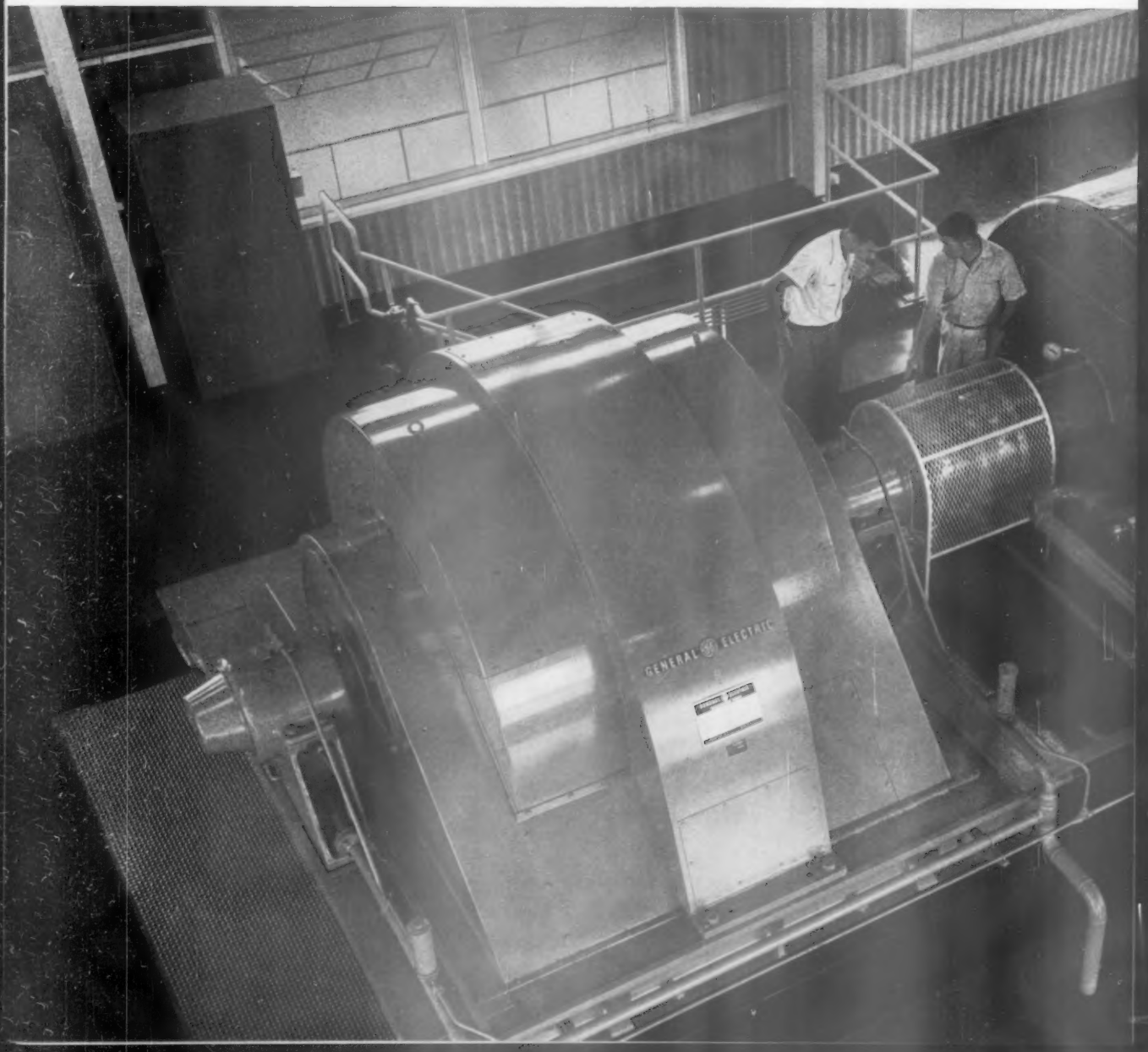

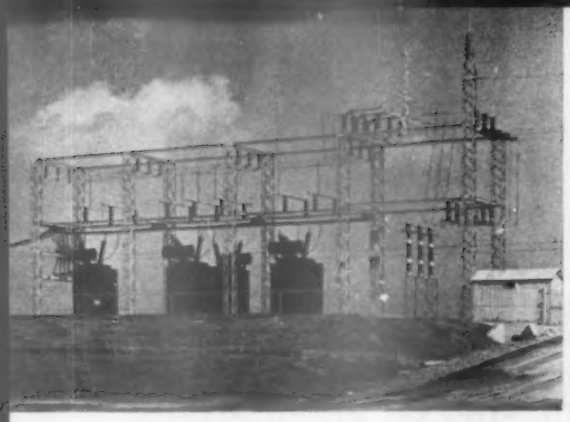

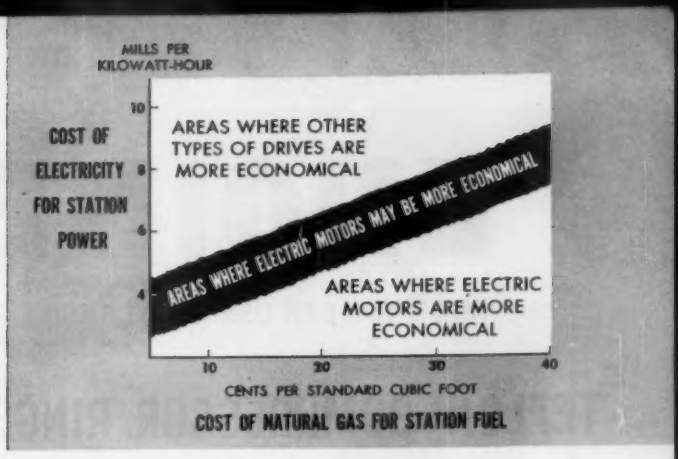

compressor drive...

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G-E 12,500-HP SYNCHRONOUS MOTOR and 900/4823 rpm gear driving compressor at new installation in North Carolina. This compressor station boosts typical summer volume of over one billion cubic feet of gas daily.

As the demand for natural gas increases, the use of electric power for driving pipeline compressors becomes more attractive. With low-cost electricity—readily available to pipeline companies in an increasing number of areas—General Electric high-speed synchronous motors give you these important advantages:

MAXIMUM RELIABILITY is inherent in the uncomplicated General Electric synchronous motor. Few moving parts, simple lubrication, and a pressurized air cooling system give you dependable, low-maintenance operation, day after day.

LOW INSTALLED COST is characteristic of compact General Electric motor drives. Initial cost of the G-E synchronous motor is significantly under that of other types of prime movers. And its installation—requiring much less space and foundation for its small size and weight—is simpler, faster, and less costly.

AUTOMATIC CONTROL of the compressor station is enhanced by the simplicity and ease of control of the G-E electric-motor drive. In addition, General Electric can co-ordinate the motor, gear, station control, and remote supervisory control for a completely integrated system which can be operated from miles away.

For information on how General Electric can help you analyze the economics of fuel/power costs in the locality of your next compressor station, call your General Electric Apparatus Sales Office or write to Section 661-01, General Electric Company, Schenectady 5, N. Y.

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TEFLON* COMPRESSOR RINGS... for special applications

- **TEFLON eliminates or minimizes compressor lubrication**
- **TEFLON is inert to most harmful chemicals and solvents**

Cook-engineered Teflon packing and piston rings now make it possible to reduce or completely eliminate compressor lubrication. Because of its extremely low coefficient of friction—its toughness and resiliency—Teflon is suitable for both lubricated and non-lubricated ring service.

And just as important, Teflon is completely inert to most chemicals and solvents—thus prevents costly product contamination or other damage which might result with ordinary ring materials.

If your special processing applications demand "borderline" compressor lubrication, you'll want to investigate Cook's Teflon rings. You can get them any size. And they are available in many special Teflon blends, depending on your application. Ask a C. Lee Cook representative to give you the details.

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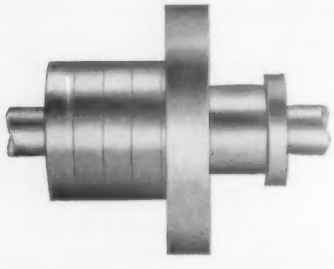
If you would like more complete information about new Teflon packings and Teflon piston rings for your specific applications, just write: C. Lee Cook Company, 934 South 8th Street, Louisville 3, Kentucky.



NEW PACKING DESIGN TAKES HEAT OFF TEFLON RINGS

This unique packing design now being developed by Cook keeps Teflon rings cool! It is a new idea for application where Teflon's qualities are needed, but where normal operating conditions develop too much heat for conventional designs.

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Rings and Packings Since 1888

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reliable multicomponent blenders
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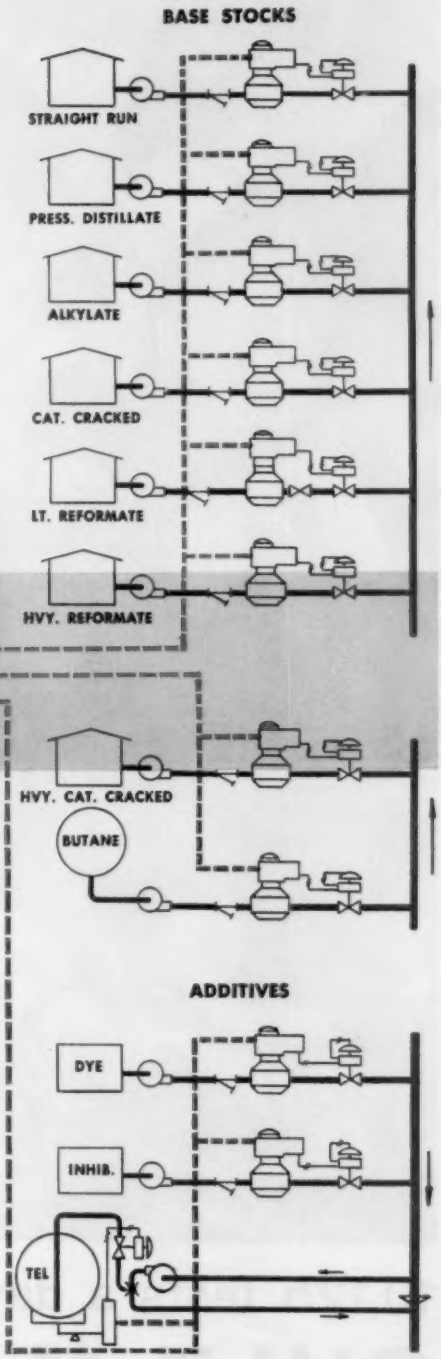

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- Compact control console can be located at most convenient spot *away* from blend manifold.
- Exclusive interchangeable modular construction increases flexibility . . . cuts maintenance . . . facilitates servicing.
- Preformulation "dry run" tests save product.
- Electronic field service eliminated with single replaceable module.
- Only electronic blender with memory feature.
- Automatic setting — statically from punched data cards — dynamically from customers computer center.

Dependable Proportioneers stream blending systems are producing blends from base stocks throughout the world without intermediate tankage, cutting investment and operating costs, increasing production. The new electronic console makes this proven system even better!

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10,125 tests a day assure consistent quality in

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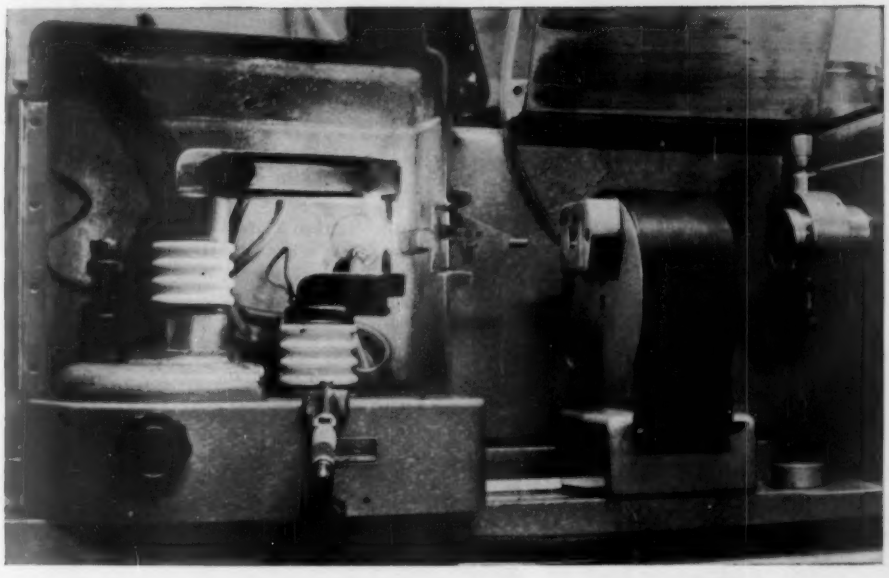
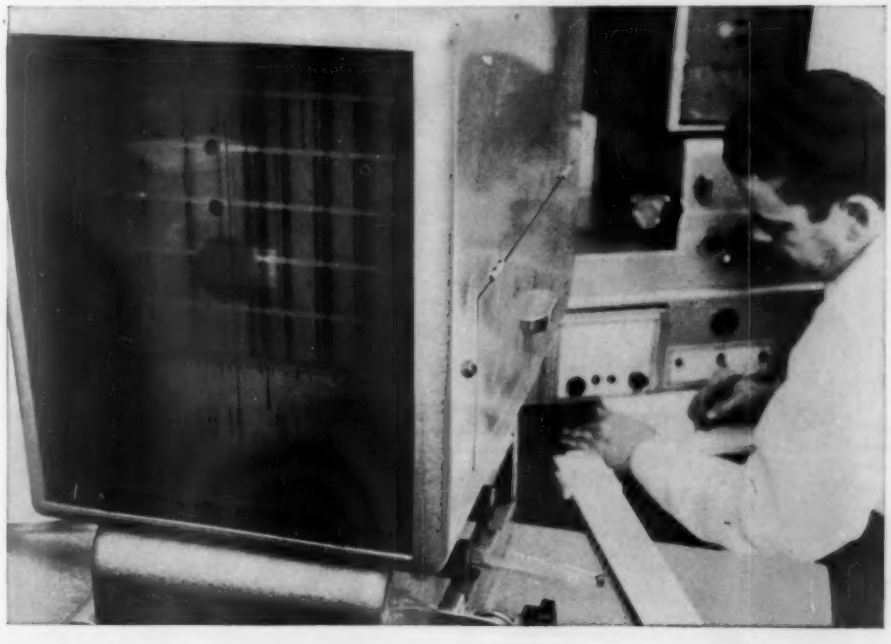
Product purity is policed constantly at Gulf. During the refining process, samples from *every* lot of Gulf gasoline, diesel fuel, lubricating oil and grease are tested and re-tested to make sure that formulations are exact and that impurities are essentially eliminated. For ex-



Emission Spectrograph (above) causes undesirable elements in a petroleum sample to emit their characteristic light spectrum which is photographed on a strip of film. In the Densitometer (below) the spectrum on the film is evaluated to identify the presence of metal contaminants down to less than one part per million.



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City _____ *Zone* ____ *State* _____

Your Name _____

Position _____

Selecting A Motor Drive For A Hazardous Area?

Here's how

TEIGF motors

by E-M

provide safe, dependable, economical power

Faced with the problem of driving hydrogen compressors in atmospheres which might contain hydrocarbons at their Baltimore refinery, engineers of Esso Standard Oil Company turned to TEIGF (Totally Enclosed Inert Gas Filled) Motors. Horsepower requirements exceeded the practicable limits under which explosion-proof motors could be used.

An important consideration was getting the greatest possible drive economy while operating safely in a possible hydrogen atmosphere. Three E-M 350 hp, 390 rpm TEIGF Motors are on duty at Esso Standard Oil Company fulfilling these important qualifications.

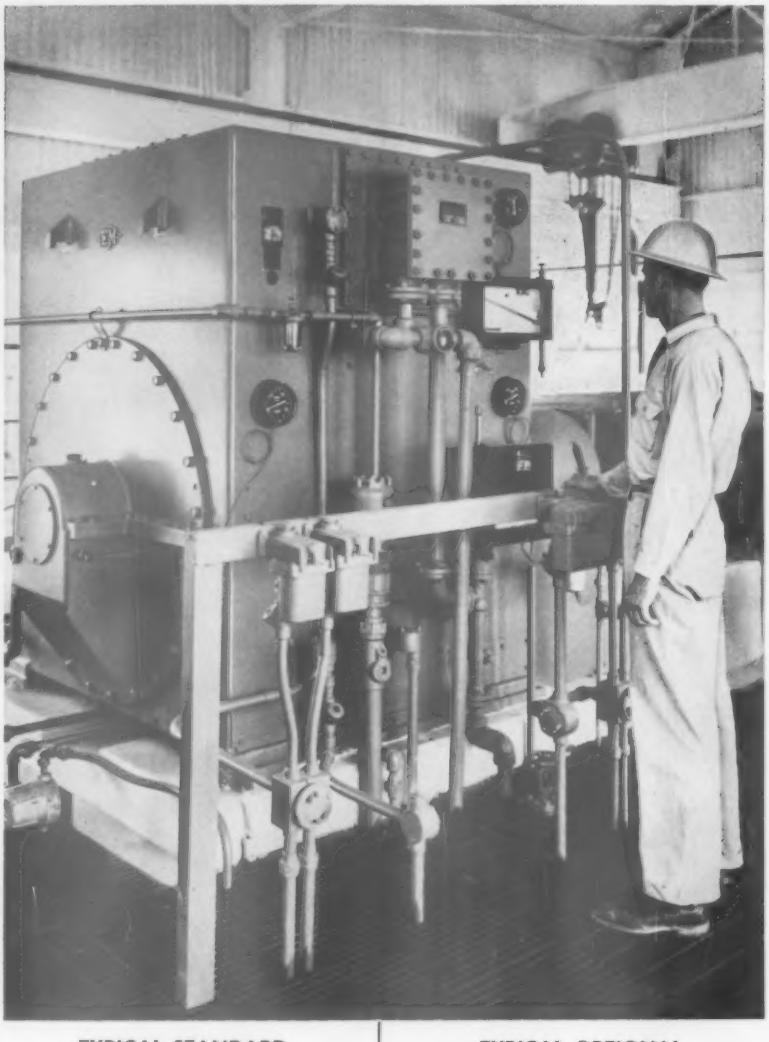
For Esso Standard Oil Company and other companies with similar problems, these E-M Motors offer three main groups of advantages:

1. SAFETY — Within the motor enclosure, inert gas pressure above atmospheric keeps explosive hydrogen out. A series of features help accomplish complete safety . . . inert gas pressure gauges . . . temperature gauges . . . purging valves, etc. and a full line of optional equipment. The E-M TEIGF Motor can be "customized" to meet your needs exactly.

2. RUGGED DEPENDABILITY. E-M uses specially designed "box type" frames of heavy-duty plate steel reinforced with heavy bar-stock ribs. They cannot twist or distort. Air gap is accurate and permanent, as all frame welding is completed before precision boring. Ventilating gas passages are carefully engineered to provide unimpeded gas flow for optimum cooling.

3. ECONOMICAL OPERATION. In E-M TEIGF Motors, gas loss is lower than commercially accepted standards. Specially designed shaft seals are oil-pressure gas-sealed bearing type, virtually non-wearing. Where bolts enter outside casing, E-M engineers specify blind holes . . . tapping and drilling are done *into* casing, not through. Operating and maintenance costs are at a minimum.

Consult your nearest E-M sales engineer, or write the factory for TEIGF Motor Bulletin No. 226.



TYPICAL STANDARD FEATURES INCLUDE:

1. Top-mounted gas-to-water cooler for use with suitable cooling water supply.
2. Forced-feed lubricated bearings and oil-pressure gas seals.
3. Oil pump, motor and oil filter. (Can be supplied optionally inside enclosure.)
4. Inert-gas temperature gauge.
5. Inert-gas pressure gauge.

(additional features shown in Bulletin No. 226)

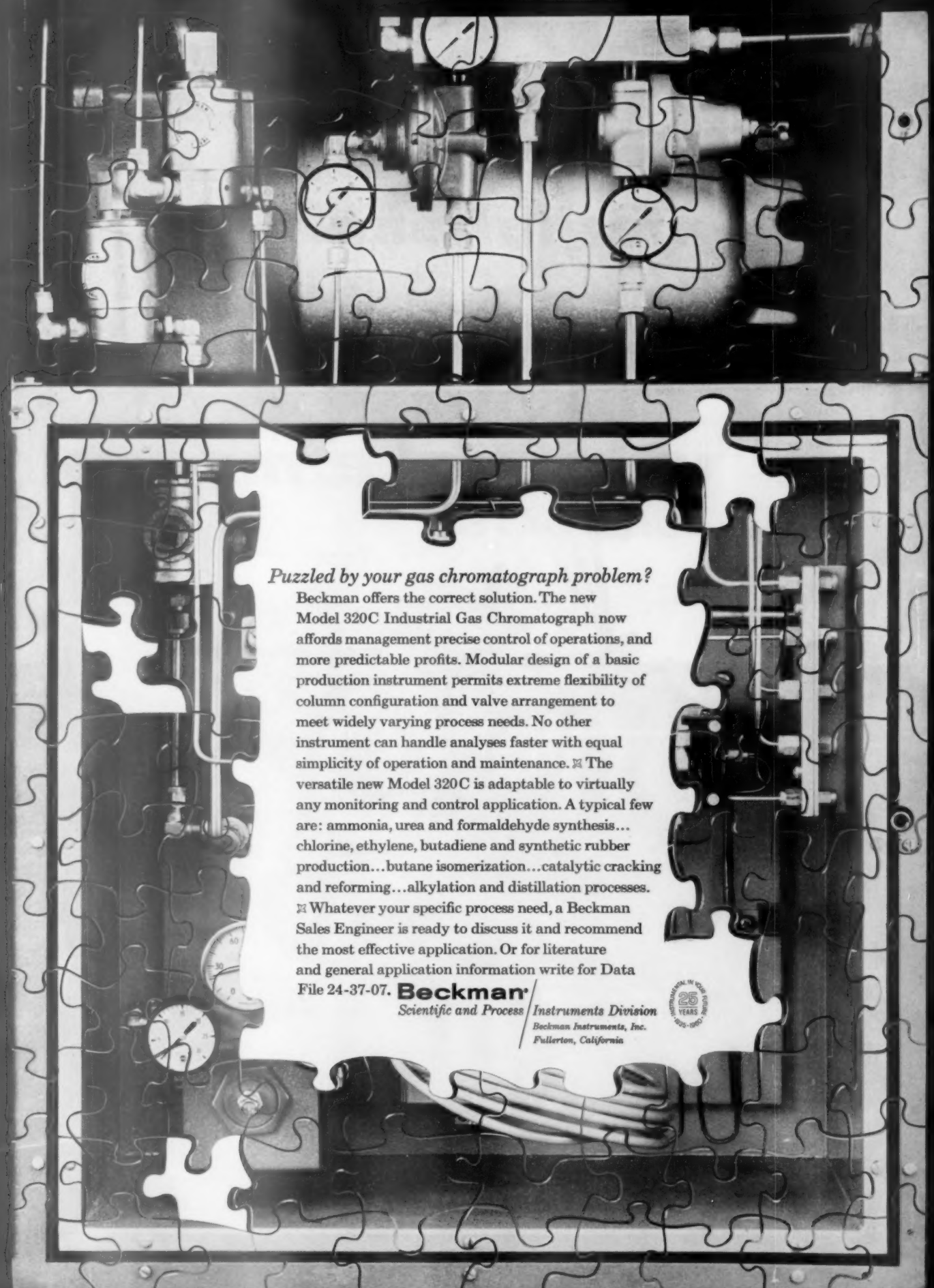
TYPICAL OPTIONAL FEATURES INCLUDE:

1. Water cooler with double-tube construction for added protection against leakage.
2. Liquid level detector switch. Accumulation of moisture within motor sounds alarm or shuts down motor.
3. Bearing temperature relays, to sound alarm or shut down motor.
4. Explosion-proof motor terminal pothead or inert-gas filled terminal box.
5. Water flow indicator. Can be adapted for use with pneumatic-type regulating device.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

Specialists in making motors do
EXACTLY WHAT YOU WANT THEM TO

E-M
1300—TPA—2179



Puzzled by your gas chromatograph problem?

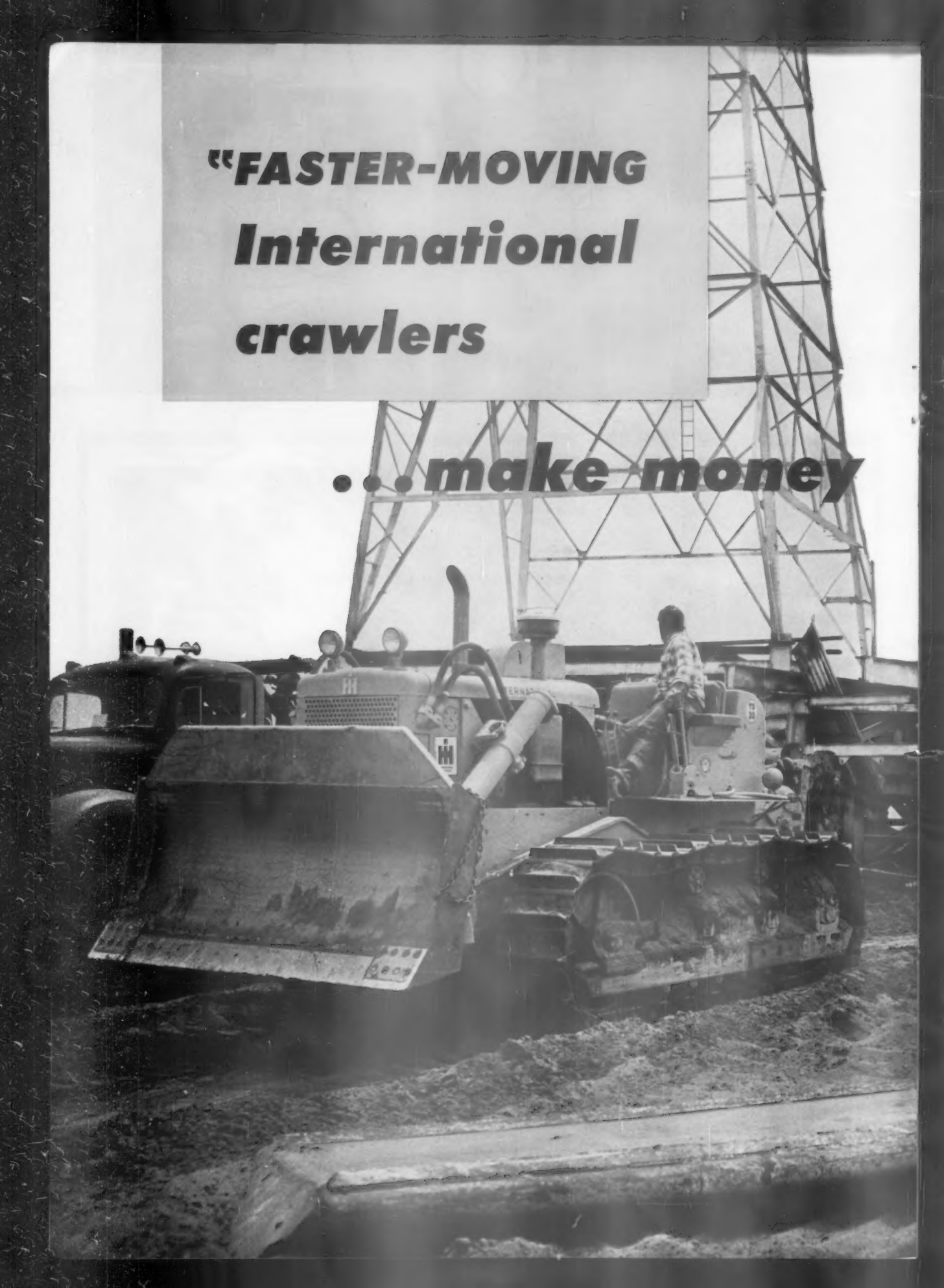
Beckman offers the correct solution. The new Model 320C Industrial Gas Chromatograph now affords management precise control of operations, and more predictable profits. Modular design of a basic production instrument permits extreme flexibility of column configuration and valve arrangement to meet widely varying process needs. No other instrument can handle analyses faster with equal simplicity of operation and maintenance. ⌘ The versatile new Model 320C is adaptable to virtually any monitoring and control application. A typical few are: ammonia, urea and formaldehyde synthesis... chlorine, ethylene, butadiene and synthetic rubber production...butane isomerization...catalytic cracking and reforming...alkylation and distillation processes. ⌘ Whatever your specific process need, a Beckman Sales Engineer is ready to discuss it and recommend the most effective application. Or for literature and general application information write for Data File 24-37-07.

Beckman

Scientific and Process Instruments Division

Beckman Instruments, Inc.
Fullerton, California

INSTRUMENTATION IN YOUR FUTURE 25 YEARS 1935-1960


"FASTER-MOVING
International
crawlers
. . . make money

"My International crawlers move faster on setting up or taking down rigs, and other lease location jobs," states D. E. McCain for his rig company. "I know these crawlers save time and make me money doing jobs faster (than other outfits)."

Here's the newest member of his fleet: The TD-20. Its engine is a high-torque 134-hp Diesel—with International Diesel starting ease and operating economy.

"Single-stick" shift—Shuttle-Bar Control! You match speeds exactly to working conditions with the TD-20's 6-speed, full-reverse transmission. Change gears and change forward-reverse directions with one fast hand sweep of the "single-stick" shift, and the Shuttle-Bar control lever.

You get the high power transfer efficiency and built-in heat-defiance of International's sintered-metal-faced engine clutch—in the TD-20. This simplified design increases TD-20 "get-aroundability" and big capacity; also simplifies maintenance!

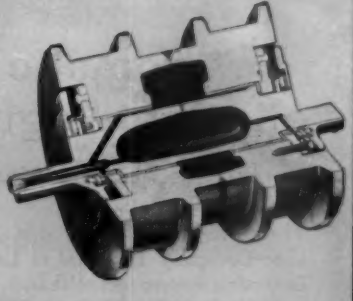
Bridge-strong track frames of heavy-duty, gusset-braced, welded box sections form the TD-20's shock-resistant undercarriage. Exclusive International 3-point mounting allows free track oscillation for rough oilfield duty—and maintains positive, life-prolonging alignment.

Compare TD-20 performance to anything else its size on tracks—for capacity, economy, and long life. Measure the "20's" cycle-speeding fast-acting controls that give full advantage of six speeds forward and reverse. See your International Construction Equipment Distributor for a demonstration.

doing jobs quicker"

—D. E. McCain Rig Co., Midland, Texas

Here's D. E. McCain's TD-20 ready to apply 27,500 lbs. of drawbar pull—to position a 40-ton platform fast, for loading on a truck. This contractor specializes in location lease work in the Odessa, Texas, field.



TD-20 weight rides smoothly on International Dura-Rollers that feature the industry's thickest shells for super strength; king-sized lube reservoirs; and full-floating, precision-lapped seals. Exclusive pressure relief passages let you power-lubricate Dura-Rollers without affecting seal life or efficiency.

International®
Construction
Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE

2-pen Foxboro Dynalog Recorders chart both upstream interface profile and station profile on Phillips' two pipelines. Upstream record allows operator to select best cut point well in advance of interface's arrival.

Automatic Foxboro interface detection system eliminates guesswork at Phillips pipeline terminal

operators get interface profiles in advance...know exactly when to switch tanks

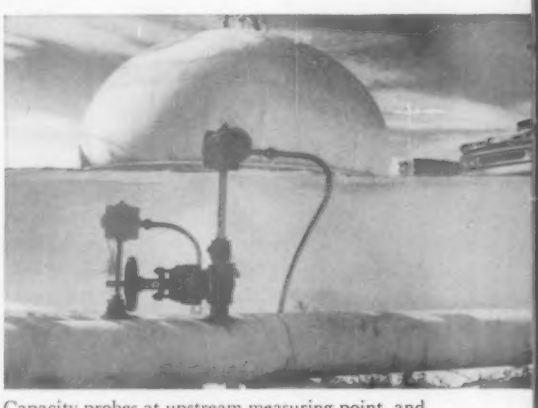
There's nothing haphazard about interface detection at the Phillips Pipe Line Company Terminal in East Chicago, Indiana. A Foxboro Interface Detection System sees to that.

This unique Foxboro system is based on the fact that even slight differences in grades or brands of petroleum products have measurably different dielectric constants. Sensitive Capacity Dynalog* Recorders measure this difference, both at the pipeline delivery station, and at a point 3 miles upstream. Foxboro Teletax* Telemetering brings the two measurements together on a single chart at the delivery point.

From the shape of the upstream record, the operator selects the best cut point and sets his index. When station interface record matches index, switch-over is made.

Phillips dispatchers find their Foxboro system eliminates sampling and guesswork — cuts product contamination to a new minimum. It can do the same for you. Ask your Foxboro Field Engineer for full details, or write for Bulletin 20-11. The Foxboro Company, 609 Neponset Ave., Foxboro, Mass.

Reg. U.S. Pat. Off.



Capacity probes at upstream measuring point, and at terminal (shown above) measure dielectric constant of product passing through pipeline. Upstream measuring station is unattended — profile is telemetered to Dynalog Recorder at terminal.

FOXBORO

REG. U. S. PAT. OFF.

What price luxury? Gasoline is taxed more than mink.

Indispensable gasoline is taxed an average 33%, Milady's mink—10%. When consumers complain, however, about "the high price of gas," they don't seem to know they now pay less (before taxes) for 100 octane gasoline than they did for 50 octane thirty-five years ago. They don't know that two gallons now do the work of three, saving them millions of dollars each year. They don't know, but you do. Next time you get a chance, tell them about it.

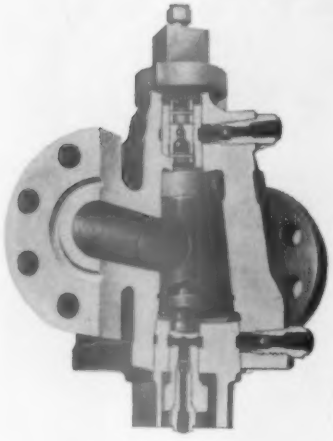
SHELL OIL COMPANY

the idea:

Lubrication Makes Things Work Easier, Last Longer

The first recorded use of specially compounded lubricants (a cooked mixture of animal fats and calcium soap) was on chariot wheels in 1400 BC. Today, 34 centuries later, it is still common sense that *any* lubricated mechanism will work easier, last longer and cost less to use than a non-lubricated one.

the application:



How It Helps Give You A Better Valve

In the Rockwell-Nordstrom *lubricated* plug valve, metal-to-metal wear is practically eliminated by lubricant. And, the hydraulically compressed lubricant forms a powerful barrier against leakage around the plug. By jacking against the small end of the tapered plug to keep it free, lubricant also assures instant ¼-turn operation.

the benefits:

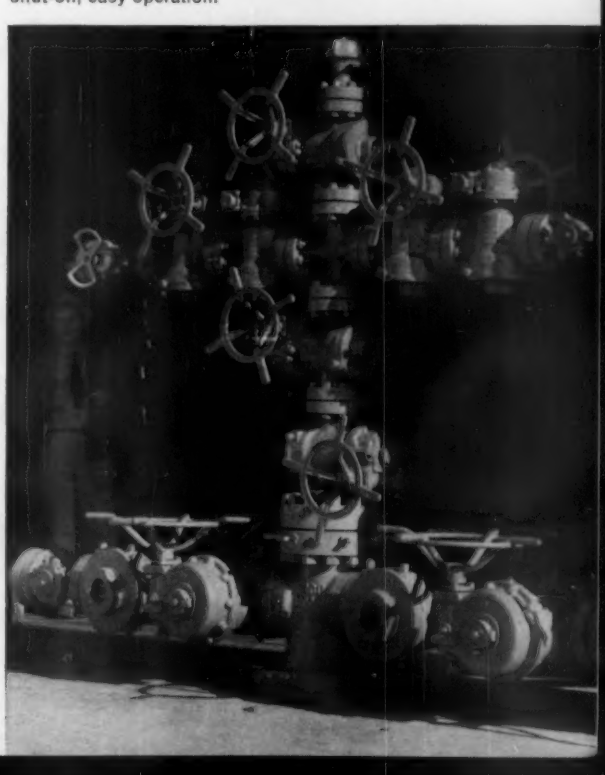
Longer Valve Life At Lower Cost... Leak Proof Sealing... Instant 1/4-Turn Operation... No Exposed Seating

The 6 million Rockwell-Nordstrom lubricated plug valves now used in a wide variety of industries are translating these benefits into dollars and cents savings day after day. Rockwell-Nordstrom is the most complete line of lubricated plug valves (sizes from ½" to 36"; pressures to 15,000 lb), lubricants and operating accessories. For *practical* help in solving your flow control problems, see your supplier or write: Rockwell Manufacturing Company, Dept. 92-J, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International, S.A., Geneva, Switzerland.

Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES
another fine product by
ROCKWELL

High pressure Christmas tree equipped with Rockwell-Nordstrom Hypreseal valves to assure positive shut-off, easy operation.



. . . *protects easily-contaminated liquids and tank cars, too*

Liquids that pick up contamination from, or that tend to damage steel have long been shipped in GATX tank cars protected with organic coatings. For some products this is still the best method. For others, a new kind of protection—KANIGEN chemical plating—provides the answer.

Already several hundred tank cars lined with KANIGEN, General American's hard, corrosion-resistant nickel alloy, are in use, transporting caustic soda, tetraethyl lead, toluol, fatty acids, glycerine, ethylene oxide, resins and many other easily-contaminated materials.

Unlike some coatings which must be replaced periodically, KANIGEN is permanent. Cars lined with KANIGEN give you more miles on the road, far less down-time, than other kinds of protective coatings. Call us about tank cars lined with KANIGEN —as well as other special GATX cars. You can lease them from General American without capital investment or operating worries.

You'll find *it pays to plan with General American.*

Tank Car Division

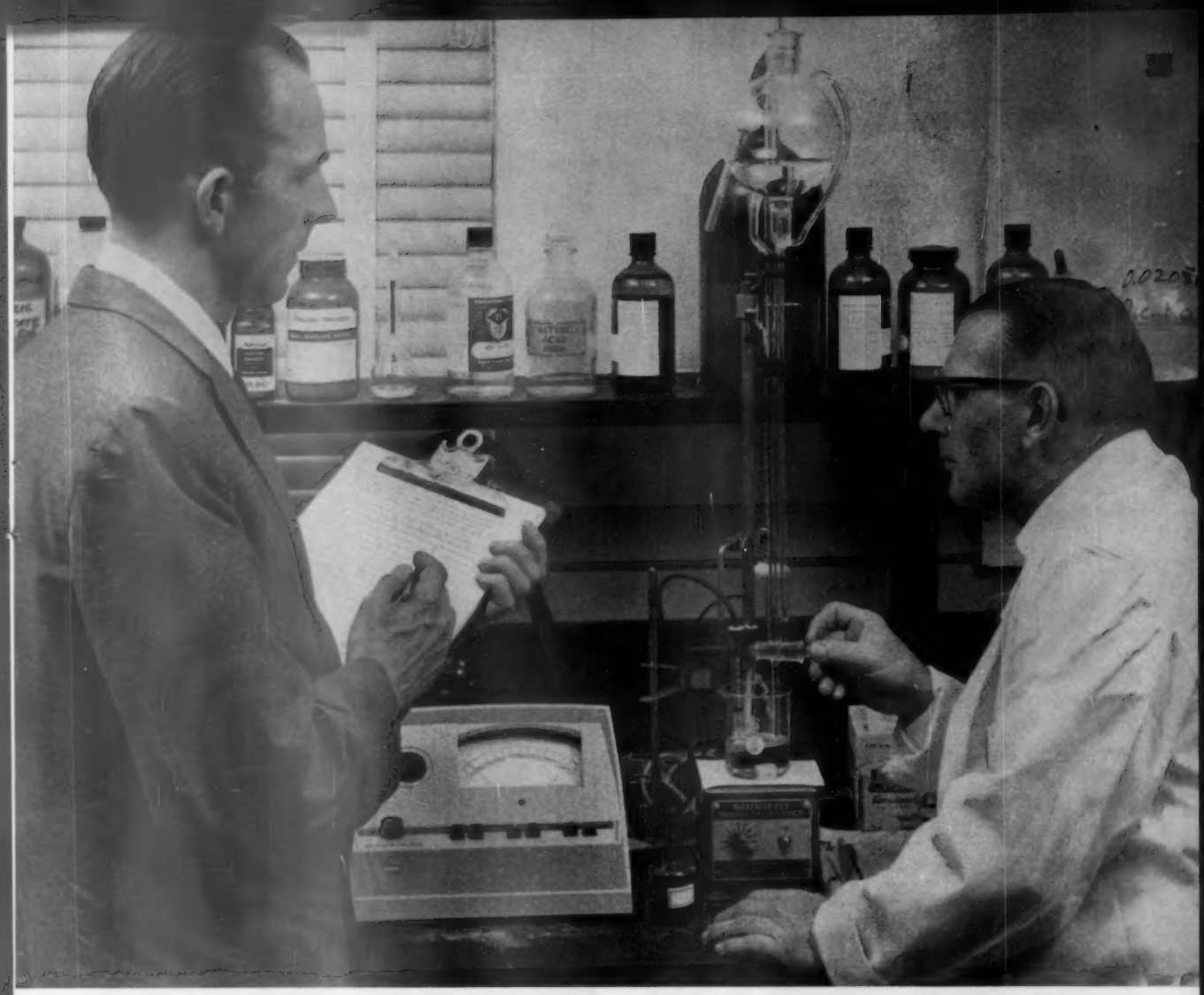
GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street • Chicago 3, Illinois

Offices in principal cities

In Canada: Canadian General Transit Co. Ltd., Montreal • In Mexico: General American de Mexico, S.A., Mexico City

GATX GENERAL AMERICAN TRADE MARK



Jefferson Gas Processing Specialist takes your problem to the laboratory

Specific analyses of amine solutions are often needed to pinpoint gas sweetening difficulties. After studying your problem, Jefferson's Gas Processing Specialist will know which analyses to recommend. Frequently, he will request samples to be sent to Jefferson's Austin Laboratories, where analytical equipment and specialized experience, not ordinarily found in plant laboratories, are available.

Let's say your sample is a lean diethanolamine solution and he needs to know such factors as: DEA from alkalinity before and after ion exchange; DEA calculated from Kjeldahl test for total nitrogen; analysis of other nitrogenous materials such as ammonia, thiocyanate, etc.; determination of heat stable salts present; viscosity; alkali metals; iron and iron capacity. Jefferson's Gas Processing Specialist requests and coordinates these tests. His detailed interpretations of the results are correlated with information on your specific operating conditions. Successful remedies to your problem most likely follow.

Prompt, dependable technical services plus ethanolamines and glycols in any quantity . . . they're yours from Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

Ethylene and Propylene Oxides, Glycols, Dichlorides, Carbonates
SURFONIC® Surface-Active Agents • Ethanolamines • Morpholine
N-Alkyl Morpholines • Polyethylene and Polypropylene Glycols
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JEFFERSON CHEMICALS

004

engine power
BY CATERPILLAR

LIBYAN DESERT PENETRATED BY WORLD'S LARGEST TRAILER-MOUNTED RIG

Few locations subject engines to conditions as brutal as those faced by eight Cat Diesel Engines that power Camdrill International's rig, "Desert Star No. 2." The rig will operate in the Libyan desert where temperatures range from 32° to 130° and sand and dust storms are frequent. The trailer-mounted rig will move twelve to fourteen hundred miles over roadless desert in search of oil.

Engines have oversize radiators, dual air cleaners and dual fuel filters to combat the extreme desert conditions. Special filters give these engines tolerance for fuels from crude oil to higher grade diesel fuels, whatever is available at distant drilling sites.

What kind of engines must a rig like this have? In a word: "Dependable." Another way to say dependable is to say "Caterpillar." Eight Cat Engines furnish all the power this rig needs. Two Cat D397s drive the drawworks through a two-engine, three-shaft in-line compound. An Emsco D300 slush pump gets power from another D397. A propeller shaft drive from the drawworks compound plus a fourth D397 provide power for an Ideco 600 slush pump.

Two D339 Electric Sets, on a utility trailer, power auxiliary equipment and lighting. Power for the base drilling camp site comes from two D342 Electric Sets.

The characteristics of Cat Engines which so well suit them to extreme conditions, such as these, make them your choice where circumstances are less grueling. Portability. Dependability. Extreme fuel tolerance. Freedom from complicated maintenance. Factory parts and service *everywhere* in the free world. Each is a good reason to choose Cat Engines and Electric Sets.

Your Caterpillar Dealer can show you how this combination adds up to high performance when you repower present oilfield equipment with any of the nine basic engines to 750 HP or Electric Sets to 375 KW. Remember, too, to specify Cat power when ordering new equipment.

WORLD'S LARGEST TRAILER-MOUNTED DRILLING RIG is this Camdrill, Inc., rig of basic Ideco Desert Rambler design. The giant rig can drill to 10,000-foot depths, is mounted on five semitrailers on 21:00 x 25-inch sand tires and will travel twelve to fourteen hundred miles over Libyan desert. Eight Cat Engines furnish all power.

CATERPILLAR

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U.S.A.

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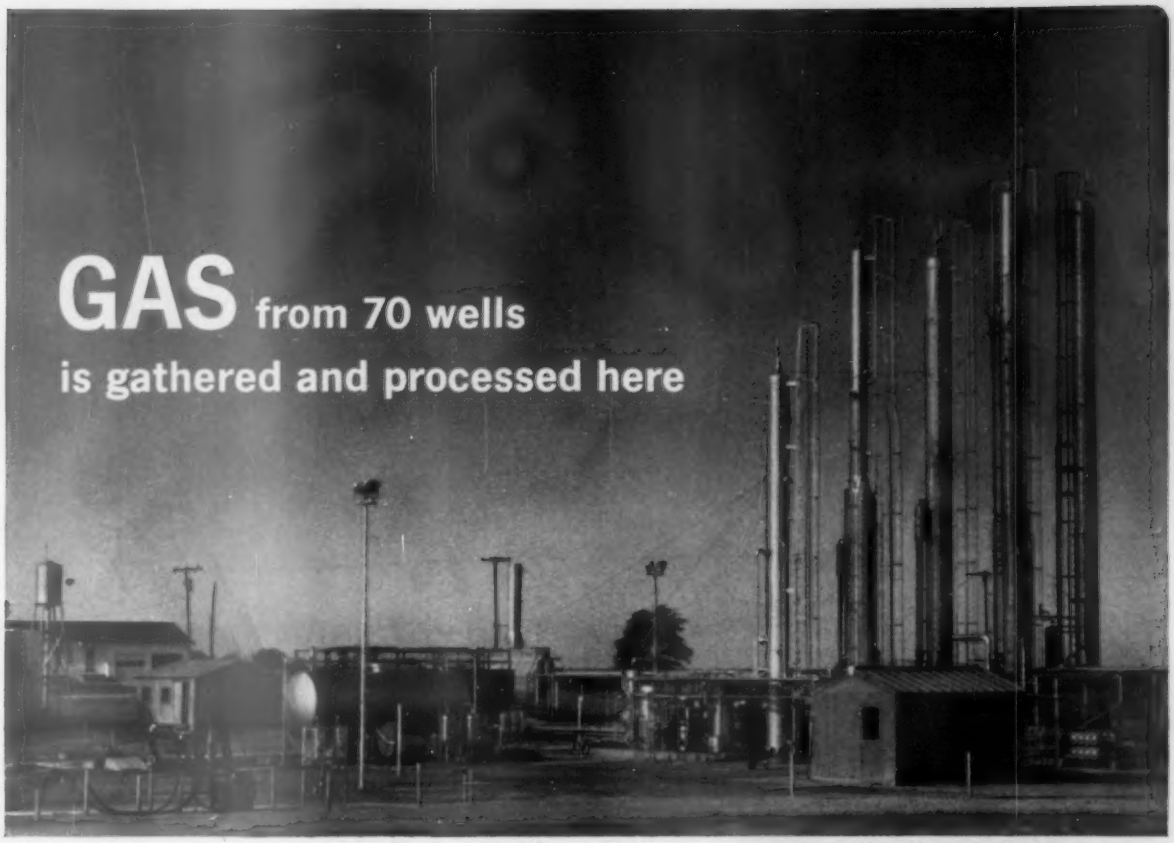


"JENKINS valves give us the dependable performance our operations demand."

— states Kerr-McGee Oil Industries, Inc., Oklahoma gas producer

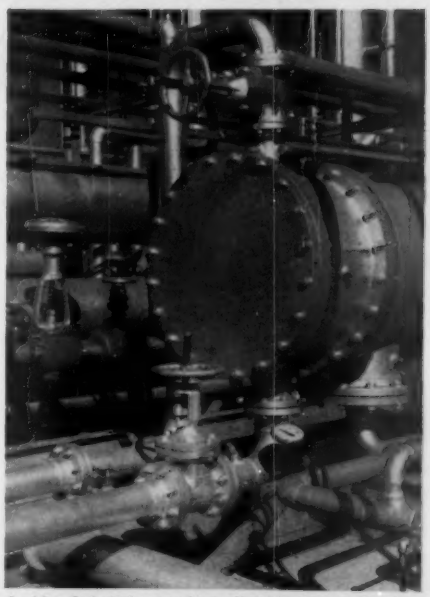
How Kerr-McGee's field processing plant in Lincoln County, Oklahoma, gathers and extracts valuable hydrocarbons from gas before delivering it to the consumer is an interesting story, briefly told below. But you need not know the process to appreciate the fact that maximum reliability in valves is a "must".

The valves that assure Kerr-McGee of dependable, trouble-free performance bear the same name as that written on piping layouts of critical jobs of all kinds for almost a century. Experienced engineers, contractors and operating executives know that "JENKINS" stands for an extra-measure of quality. They know it is the best guarantee of long, trouble-free service. There's no extra cost attached to this specification for extra quality, so you can use it for any job. Jenkins Bros., 100 Park Ave., New York 17.

HOW THE GAS PROCESSING PLANT WORKS...

Because it is a vapor at low pressure, gas is first compressed and injected into the bottom of a tall tower, called an absorber; oil is injected at the top. As the oil goes down, the gas goes up . . . the gas products are absorbed by the oil. The gas enriched oil is then processed to remove valuable light hydrocarbons.

Sold Through Leading Distributors Everywhere



Jenkins Gate Valves on lean oil cooler to the absorber

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864 Jenkins Bros.

Why Solar designs industrial gas turbines to weigh between 1 and 1½ lb/hp

by Paul A. Pitt
Chief Engineer
Solar Aircraft Company

The weight of Solar gas turbines is the result of a design philosophy that is unique in the small gas turbine field.

Most gas turbine designs fall into one of two extreme categories. Aircraft-type engines, at one extreme, embody highly sophisticated techniques for extreme light weight in relation to horsepower, but have resulting short life. The opposite philosophy employs the ultra-massiveness of steam turbines to assure long life.

There are important disadvantages in both approaches when long life, reasonable cost, dependable operation, simple maintenance and easy transportation and installation are required. While aircraft-design engines (of ¼ to ½ hp/lb) can be modified and derated for longer service life, the resulting product is inherently delicate. This compromise inevitably results in short life.

Paul A. Pitt

On the other hand, massive design (of 10 lb/hp and up) leads to unnecessary structural bulk and introduces problems of thermal lag and distortion.

Since World War II, Solar has designed and built a variety of gas turbine units with characteristics that lead to both long life and low weight. The Saturn gas turbine engine, for example, is an 1100 hp unit intended specifically for industrial and military installations. It has a weight-to-power ratio of 1.1 to 1.4 lb/hp.

Although it is designed for long life, it utilizes only enough materials in its components to satisfy structural and thermal requirements. This approach resulted in a design that makes no compromises with durability and performance, yet meets the needs of industry for flexibility in a small package. It has an 1100 hp rating at a specific fuel consumption of 0.61 lb/hp-hr and a continuous rating of 1020 hp at 0.63 lb/hp-hr SFC.

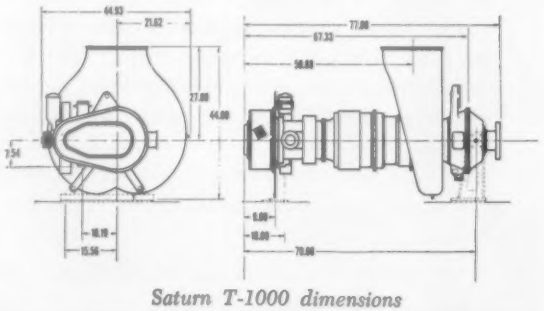
Meeting these objectives required an engine with a simple thermodynamic cycle and high efficiency components. An axial compressor was designed with an operating efficiency of 86%, and this was combined with a multi-stage, axial type turbine of advanced aerodynamic design. Over-all dimensions of the engine are shown in the figure below.

To fulfill workhorse service requirements, the engine was designed to operate at a conservative gas temperature of 1450 F continuous rating. The stress levels are also low, so that major rotating and stationary components will have more than 100,000 hours of life with long periods between overhaul. To keep costs down and assure dependability, the engine design is simple and straightforward.

In brief, the development program of the Saturn turbine adhered to three principles: Careful aerodynamic design for high performance; use of moderate temperatures and low stress levels for long life; and exhaustive component testing for ruggedness and reliability.

Presently scheduled field applications of the Saturn turbine include: Power source for 750 kw electric generator sets in process plants, portable field equipment, pipeline pumping, and gas compression in the petro-chemical industry. Other uses are as a power source for a 600 kw generator set in a commercial marine installation, propulsion units for marine and amphibious vehicles, and prime movers for off-highway vehicles.

Detailed data on Solar gas turbines and other turbomachinery is available. Write Dept. H-154, Solar Aircraft Company, San Diego 12, California.



Saturn T-1000 dimensions

SOLAR
AIRCRAFT COMPANY
A subsidiary of International Harvester Company

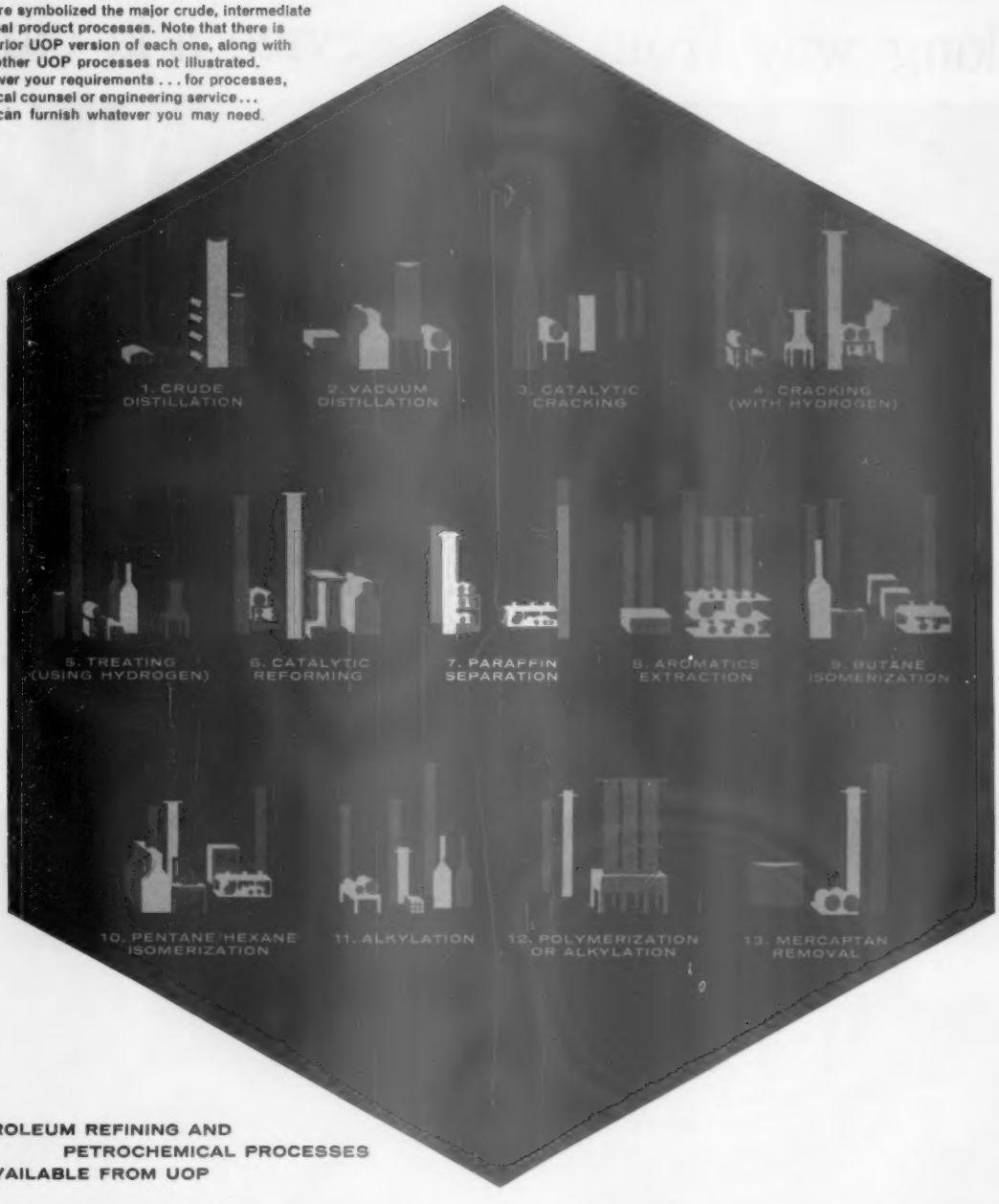
A long way from curb service a la cart

YESTERDAY — Back at the turn of the century, when automobiles were jeered as well as cheered, gasoline was dispensed by hand. It was poured from a measuring can into the tank through a chamois-screened funnel. Remember? Later, it was hand-pumped into a glass bowl on top and flowed by gravity down through the hose.

TODAY — modern service stations have automatic, meter-computing pumps. Texaco alone has over 38,000 stations in the U.S.A. They are manned by skilled Texaco Dealers, offering quality Texaco products. Aided by research and the most modern refining and transportation techniques, Texaco has become one of America's leading petroleum marketers.

TEXACO

Here are symbolized the major crude, intermediate and final product processes. Note that there is a superior UOP version of each one, along with eight other UOP processes not illustrated. Whatever your requirements . . . for processes, technical counsel or engineering service . . . UOP can furnish whatever you may need.



PETROLEUM REFINING AND PETROCHEMICAL PROCESSES AVAILABLE FROM UOP

1. CRUDE DISTILLATION equipment is designed and engineered by UOP in any desired capacity.

2. VACUUM DISTILLATION and **VISBREAKING**—easy-to-operate processes for preparation of feed stocks for catalytic cracking.

3. FLUID CATALYTIC CRACKING—an improved process that gives higher yields, higher octane numbers.

4. LOMAX™—highly flexible process that converts middle distillates and vacuum gas oils into gasolines and distillate fuels of outstanding quality.

5. UNIFINING™—a modern process that completely purifies petroleum distillates.

6. PLATFORMING® produces high octane gasolines, high purity aromatics.

7. MOLEX™—a new continuous separating process that removes lowest-grade hydrocarbons from gasoline.

8. UDEX®—the ideal process for separation of super-purity aromatics.

9. BUTAMER™—a new and practical process for producing isobutane.

10. PENEX®—a new process that converts light, normal paraffins to isoparaffins.

11. HF ALKYLATION—makes alkylate, top anti-rumble motor fuel. Sulfuric acid process also available.

12. CATALYTIC CONDENSATION—converts olefin fractions of refinery gases into high-quality gasoline and petrochemicals.

13. MEROX™—a new and inexpensive treating process to remove mercaptans from gasolines and light distillates.

PROCESSES NOT ILLUSTRATED:

REXFORMING®—the ideal process to insure your top octane position.

CATALYTIC DEHYDROGENATION—removes hydrogen from hydrocarbons to produce less-saturated hydrocarbons.

HYDEAL™—a new process for the hydrodealkylation of toluene or C_8 aromatics to produce benzene; may also be used for manufacturing phenol and naphthalene.

HYDRAR™—converts benzene to cyclohexane with excellent yields, achieves extreme high purity with Udex grade benzene.

OLEFIN EXTRACTION—efficiently separates olefins and diolefins from paraffins; prepares olefins for further conversion.

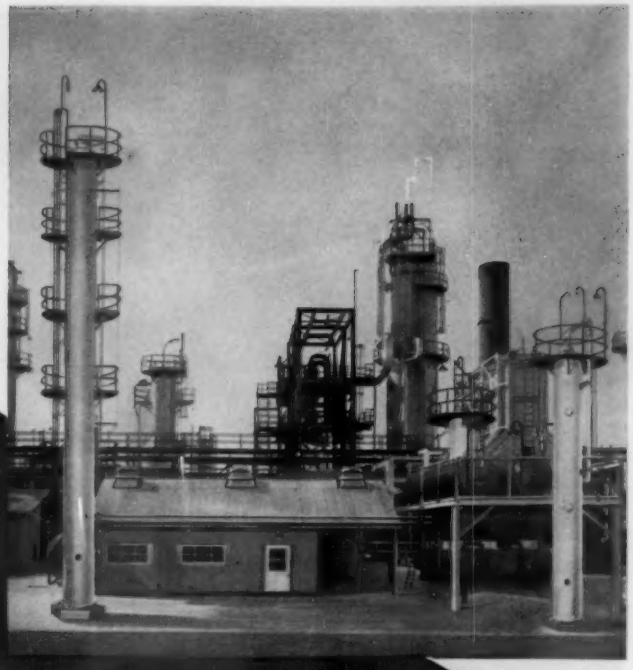
AROSORB™—removes heavier aromatics from synthetic and natural distillates, produces aromatic-free heavier distillates.

ALKAR™—produces ethylbenzene, cumene and other alkylated aromatics from Fluid Cat Cracker off-gas streams.

UNISOL®—an economical process for treating high mercaptan-containing gasolines.

MOLEX ™—Until the advent of this new UOP process no kind of fractionation, separation or chemical conversion in commercial practice could completely remove the low-grade normal paraffins from gasoline. Yet this operation alone can raise research and motor octane numbers by as much as 5% to 14%. Complete and continuous removal of normal paraffins from gasoline is the function of the new UOP Molex process.

Readily incorporated into any existing refinery setup, Molex provides an economical means of increasing pool octane . . . at the same time producing normal paraffins which can be marketed as petrochemicals or as a superior jet fuel.

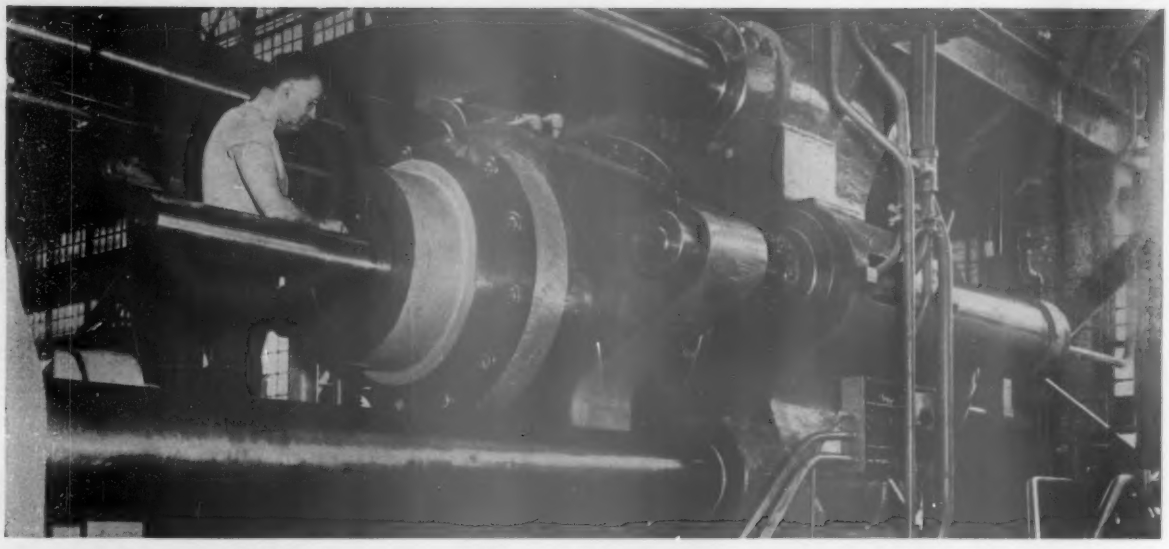


how to get
more octanes plus . . .

UOP UNIVERSAL OIL PRODUCTS COMPANY

WHERE RESEARCH TODAY
MEANS PROGRESS TOMORROW

'62 COULD BE
THE YEAR
FOR YOU!



SUN SHIP has what it takes to build . . . . .

for INDUSTRY

We're old hands at building complete machines and special equipment for use in a wide range of industries. For 44 years our large and amply equipped shops have produced items ranging from small tanks to huge fractionating towers, pressure vessels, stills, plate work and special-purpose machinery for the chemical, petroleum and other industries.

Pictured here are a hydraulic press, which was shipped by rail, and a fractionating tower ready for loading on a barge for shipment by water to an oil refinery. They are just two examples of the equipment Sun Ship contributes to many fields, also examples of our shipping facilities.

Because we have all the facilities, we build all equipment right in our own plant, without subletting. Our convenient location on the Delaware River, with direct access by rail and water to all points, assures speedy delivery.

Let Sun Ship solve your machine or equipment problem. Phone or write our Sales Engineering Department.

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introducing the first
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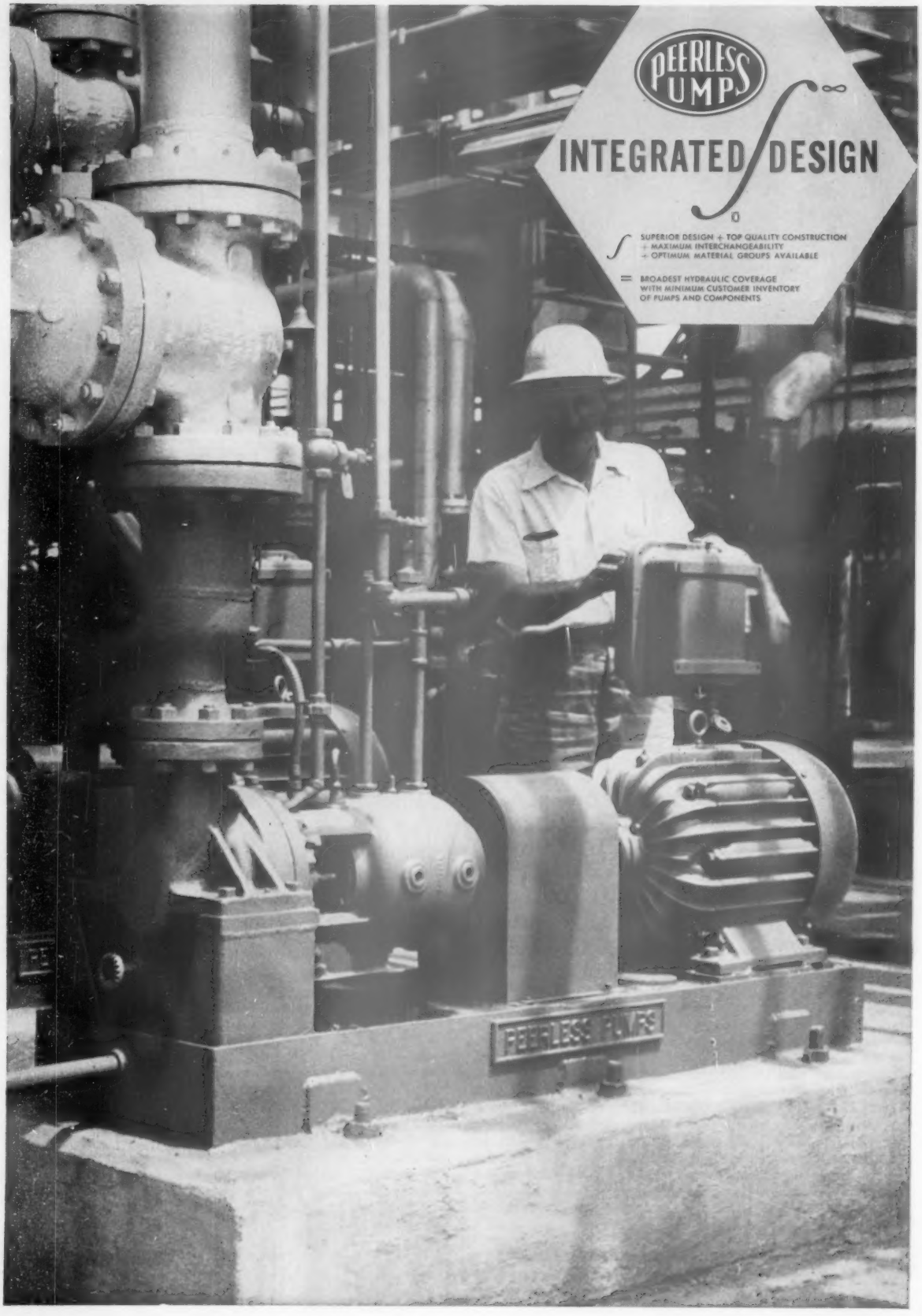
Computers that pace man's expanding mind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INTEGRATED DESIGN
SUPERIOR DESIGN + TOP QUALITY CONSTRUCTION
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MEANS YOU CAN QUICKLY MODIFY THE SAME PUMP FOR DIFFERENT CAPACITIES

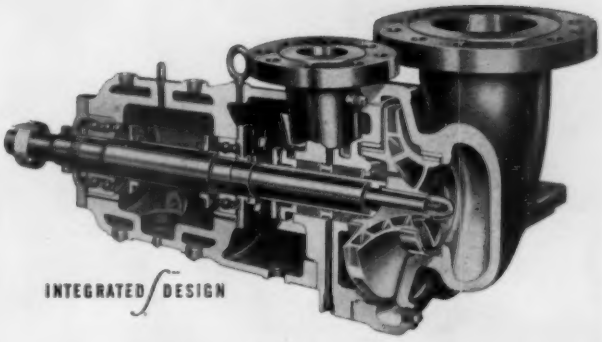
Component interchangeability permits desired pump to be assembled from standard components in a minimum of time.

Recently a large process plant in the gulf coast decided to increase its output. In the process of redesign it became necessary for a particular group of pumps to handle double their capacity. Because these pumps were integrated Peerless Type PR units, the solution was simple. By merely changing the impeller and volute, these pumps were ready to handle the higher pumping capacities required.

Unusual example? Not at all. Rather it is typical of the versatility designed and built into this line of high pressure, high temperature Peerless process pumps. Peerless PR and PRS pumps offer many other advantages. Virtually all liquids in refining processes can be pumped by these units. Widest capacity and head conditions are easily met. And the maximum interchangeability factor materially reduces inventory costs. Get the best for process pump needs, specify and buy Peerless. Send for informative Bulletin No. B-1605 now.

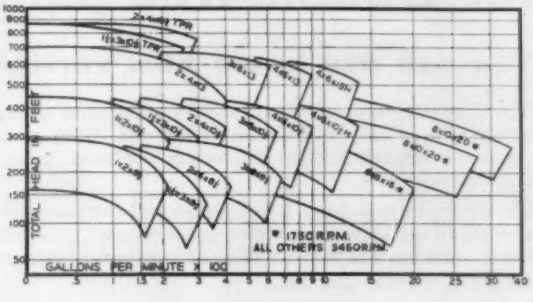
INTEGRATED DESIGN FOR GREATER EFFICIENCY AND ECONOMY

PEERLESS PUMPS



PEERLESS PR AND PRS PUMPS ARE AVAILABLE IN 1″ TO 8″ SIZES INCLUSIVE

Designed to handle hot oil, hot water, hydrocarbons and many chemicals used in the process industries. Capacities to 3000 gpm. Heads to 700 feet. Type PR (packing gland construction) handles temperatures to 850° F. Type PRS (mechanical seal) handles temperatures to 250° F. Liquid ends available in any machineable metal. Electric drive is standard: other drives as required.



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301 West Avenue 26, Los Angeles 31, California

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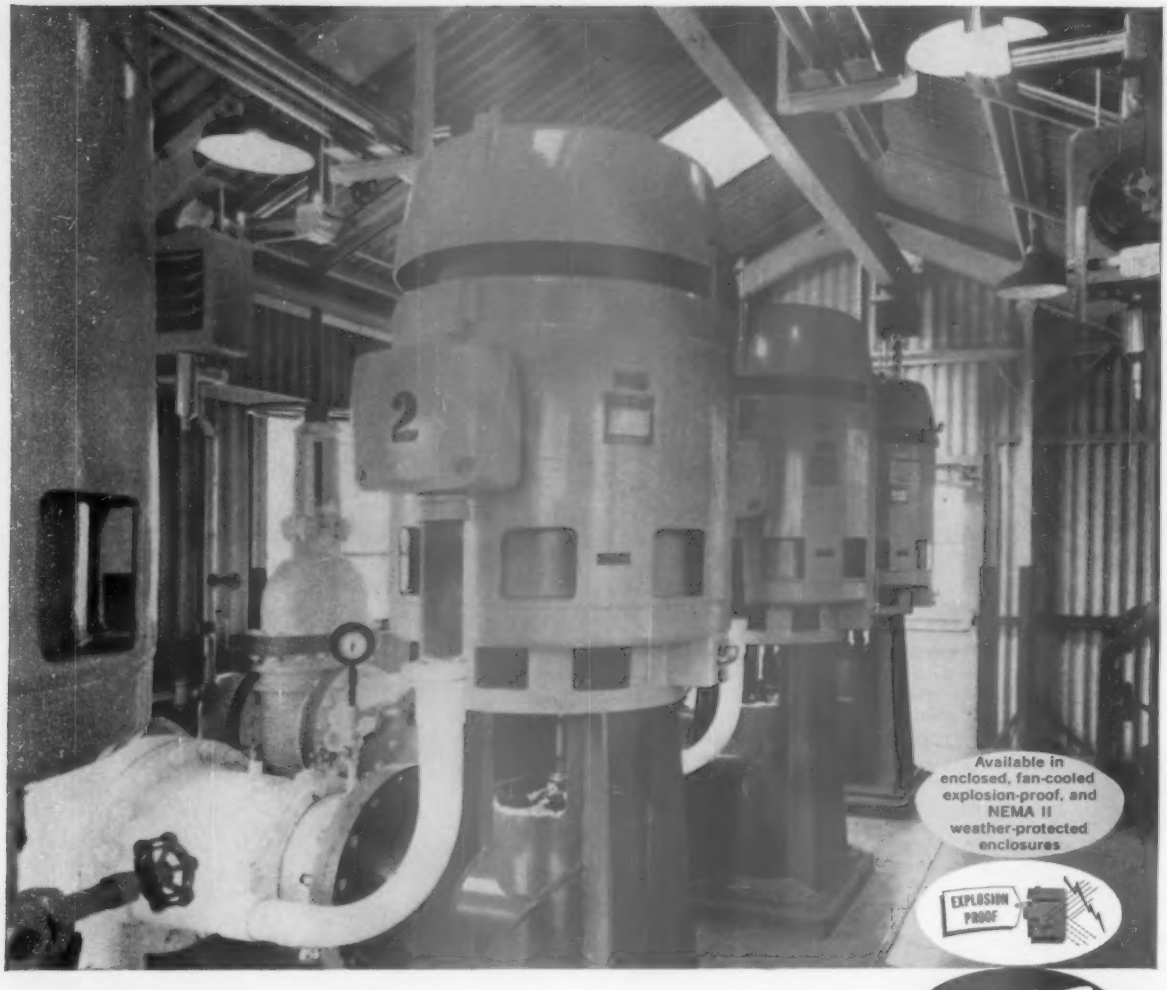

These motors are climatized for trouble-free pumping anywhere!

You can use Louis Allis vertical motors indoors or outdoors

These motors are job-designed to keep your pumps going regardless of their environment. Even under rough conditions and in untended locations, upkeep is extremely low.

For example, new M-G-L insulation and varnishes protect windings against corrosive gases, vapors, moisture, heat...and have high dielectric and mechanical strength for long, trouble-free life.

Louis Allis *climatized* design adds the all-weather protection. The snug but rugged housing and cover will not corrode. Wind-blown rain, snow, sand, and dirt can't get into the motor. The high-volume, low-velocity cooling system breathes air in through screened and baffled right-angle inlets. Thus dust and moisture are not drawn into the motor — nor can foreign matter, bugs or rodents get past the screen. It's extra-quiet, too.

You get duplex-mounted shaft bearings for maximum thrust capacity without misalignment. A self-releasing coupling automatically disengages the pump shaft and eliminates inadvertent damage in case of accidental motor reversal. The motor can be supplied with a non-reverse ratchet that prevents backspin when the motor is shut off and the column of water drains back.

You can choose Louis Allis vertical motors with hollow or solid shaft — in sizes up to 2000 hp. Contact your nearby Louis Allis District Office for application assistance. Or write for Bulletins 2450, 2500 and 2600 to The Louis Allis Co., 449 E. Stewart St., Milwaukee 1, Wis.

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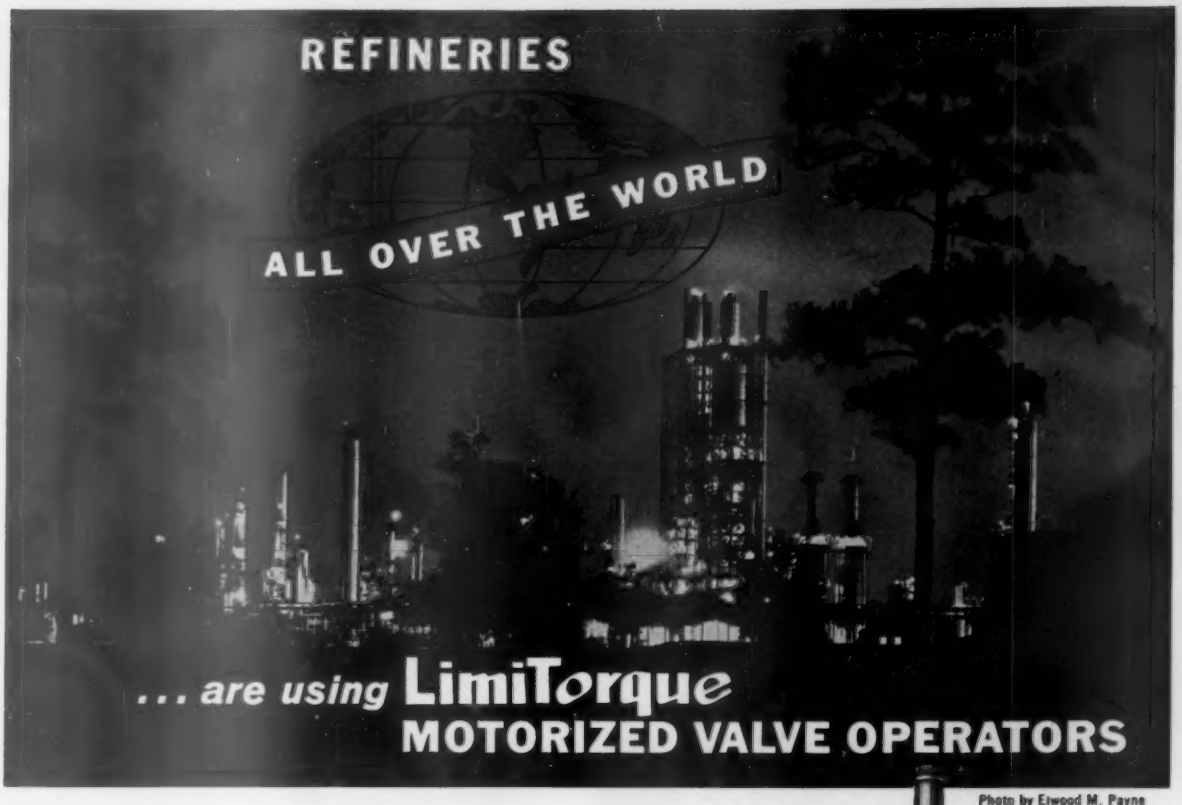
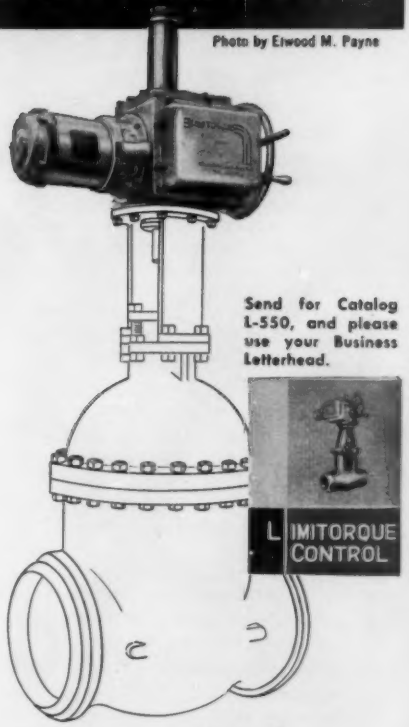


Photo by Elwood M. Payne

It is highly significant, that wherever there is a Modern Refinery, you will find vital valves operated day and night by LimiTorque Push-Button Motorized Controls . . . The reasons for such wide-spread use are many; first of course is their ABSOLUTE DEPENDABILITY under all pressure, temperature, and service conditions . . . Second, LimiTorque operators are ruggedly built, yet as accurate as a fine watch . . . And, because of a specially designed Torque Limiting Mechanism, they ELIMINATE ANY POSSIBILITY OF DAMAGE TO VALVE PARTS during the cycle of operation . . . also vitally important is the fact that they save TIME, LABOR AND MONEY . . . and, it should be kept in mind that LimiTorque is manufactured by one of the largest gear and geared products manufacturers in the World . . . it is the result of 28 years of experience.

For further information consult your valve manufacturer, or your nearest LimiTorque Sales-Engineering Office.



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GLYCOL PROCESS AND DESIGN OPERATING INFORMATION

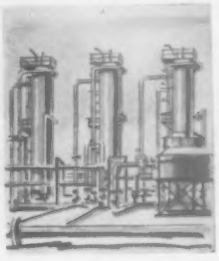
Proper use of glycols in well designed, correctly operated equipment is essential for efficient gas treating Some of these important design and operating considerations will be discussed in this series.

Dehydration with Glycols

Desiccant systems based on diethylene and triethylene glycol offer a number of economic advantages over solid dehydration units. For example, initial capital investment is less, desiccant make-up costs are lower, and operating expenditures are reduced by ⅓ to ½.

Since each operation should be considered as a special case, the following information about DEG and TEG is presented to help you determine the type of glycol best suited to your particular requirements.

Diethylene Glycol



Advantages:

1. It is stable in the presence of sulfur, oxygen and carbon at normal operating temperatures.
2. It is highly hygroscopic.
3. Carry-over losses are small.
4. It does not solidify in a concentrated solution.
5. It is non-corrosive.

Disadvantages:

1. Carry-over is greater than with TEG.
2. It cannot easily be regenerated to greater than 95% solution.
3. Dew point depression of 30-60° F. is less than with TEG. (Dew point depression is usually about 50° F.)

When oxygen and hydrogen sulfide are absent, reboiler temperatures may be raised to 330-350° F. to obtain higher concentrations of glycol and consequently greater dew point depression. Care should be exercised when using temperatures in excess of 325° F.

Triethylene Glycol

In *addition* to the advantages offered by DEG, triethylene glycol offers the following:

1. Higher dew point depressions of from 80 to 140° F. can be obtained if the TEG is dried sufficiently during regeneration.
2. TEG is easily regenerated to a 98-99.5% or higher solution in an atmosphere stripper because of its high boiling point.
3. It has a theoretical decomposition temperature of 404° F., while the temperature of DEG is 328° F.
4. Vapor pressure is 20% lower than DEG at 80° F. Thus, vaporization losses are lower.
5. Simpler regeneration equipment is required.
6. Dehydration is less expensive than with DEG — both in operating and capital costs.

Disadvantages:

1. The presence of light liquid hydrocarbons produce a tendency for foaming. The use of anti-foam agents is indicated to help control this condition.
2. Normally, it is not possible to obtain dew points as low as with solid desiccants.

In some instances, it may be possible for an operator to convert DEG units for use with triethylene glycol.

Operating Considerations

Gas temperature is a determining factor in the operation of liquid desiccant plants. Dew point depression as high as 96° F. has been obtained with TEG and 65° F. with DEG. If gas temperature is too high to give the desired water content in the dried gas, cooling should be considered. Since the initial cost of a TEG dehydration plant is generally less than half that of a dry desiccant plant, expenditure for cooling the gas is justified.

Methods of cooling fall into three basic categories: (1) Cooling by expanding the gas just ahead of the dehydrating unit . . . if pressure drop is available; (2) Use of various types of water coolers; and (3) Refrigeration. This may be accomplished by compressing the gas, removing the heat of compression and expanding, or by use of an external refrigeration unit.

In cases where an operator has an existing glycol dehydration plant which cannot meet newer, more rigid specifications for water content, consideration should be given to cooling the inlet gas or treating the gas from the glycol dehydrator in a small solid desiccant unit. These steps should be sufficient to place an existing glycol unit back into useful operation.

In cases where cooling does not provide sufficient water removal, a small solid desiccant unit may be used. This is practical, since much smaller units are needed than would be required for complete removal of water contained in the gas.

Cost of operating a glycol dehydration plant is approximately 20-60 cents per million standard cubic feet of gas. The economy of this system is apparent when one considers the cost of operating a dry desiccant plant, which is in the range of $0.60-$1.20 per million standard cubic feet of gas.

FOR MORE INFORMATION, look for future issues of Allied Chemical Contactor featuring articles on ethanolamines and glycols in gas treating operations.

We will gladly send technical data, delivery and price information on Allied Chemical Ethanolamines and Ethylene Glycols.

For specifications and local offices, see our insert in Chemical Materials Catalog, pages 475-482 and in Chemical Week Buyers Guide, pages 37-44.

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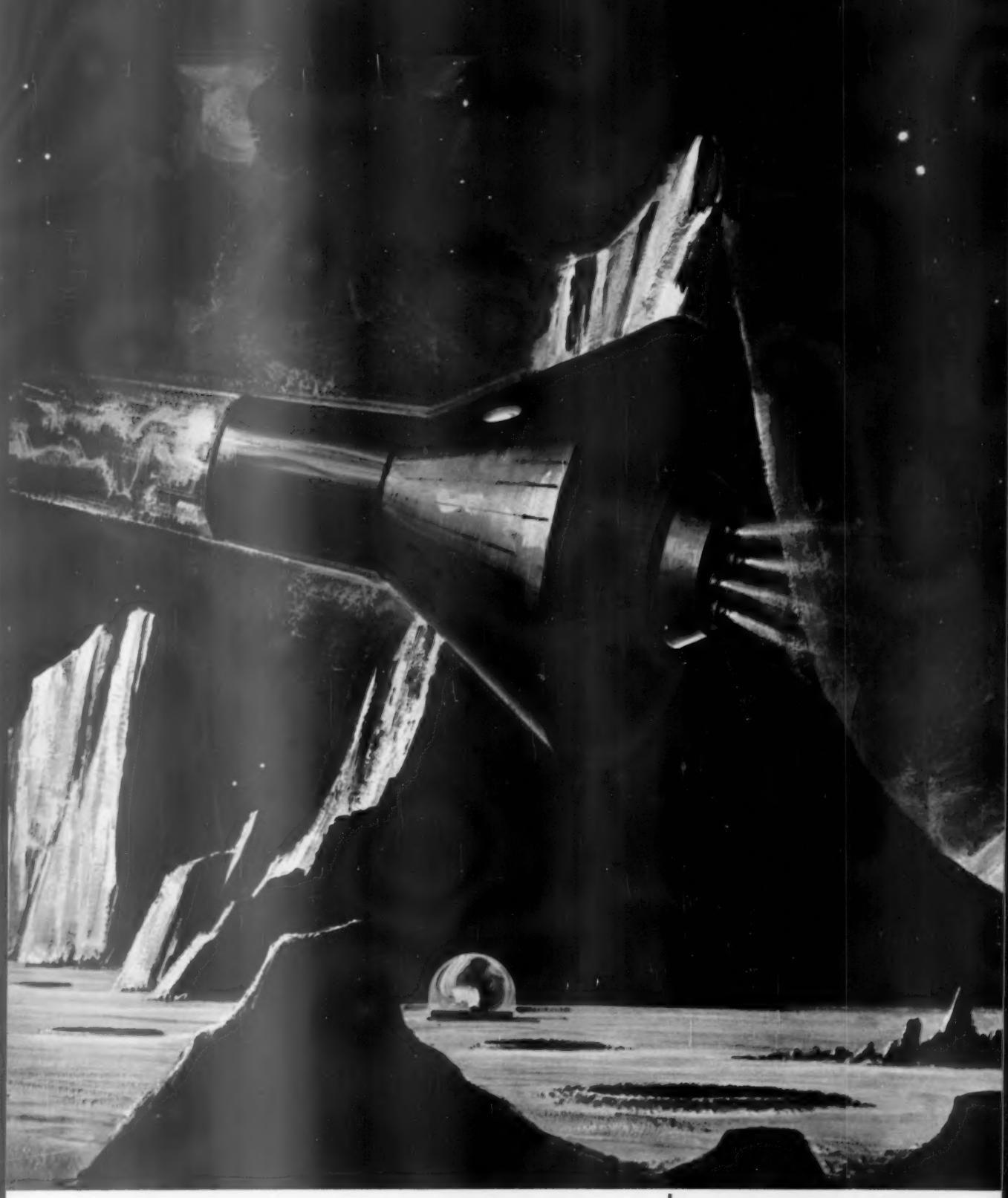

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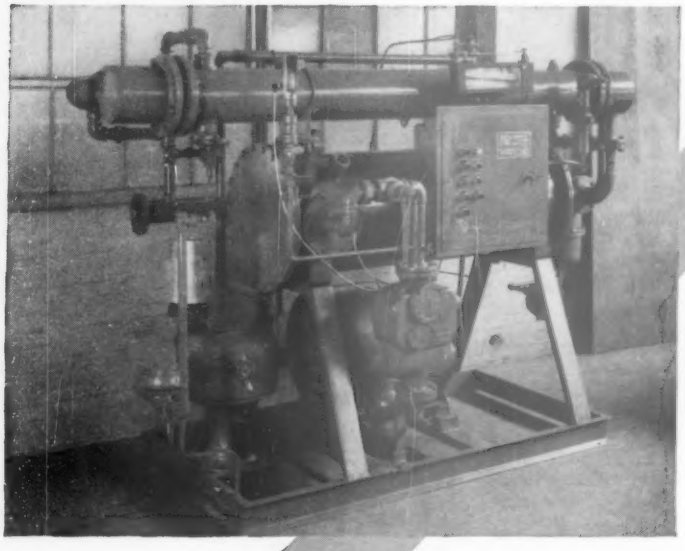
give you 4 basic advantages!



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2 **Easy start-up** is yours with Kemp Carburetor and external test burner. You test the pre-mixed gas-air ratio *before* it enters the combustion chamber. And electric ignition gets your Kemp Generator off to a time-saving, labor-saving start.

3 **Safety controls** effectively end flame-out danger. Kemp's electronic flame failure control instantly and automatically cuts off gas supply to the carburetor. Moisture and combustion chamber pressure cannot affect this control.

4 **Set it—forget it.** Once you've set the vernier dial on your Kemp Generator you can walk away and forget about it. Kemp's exclusive carburetor keeps your exact gas-air ratio coming hour after hour —as long as you wish—without further checking or manipulation of controls.

SEE THE MAN FROM KEMP

He is equipped and qualified to advise you on any size and type of generator you may require . . . can also counsel you on dryers and compressors for inert or nitrogen generation systems and heaters. See your C.E.C. Catalog for full listing of Kemp representatives in your area or check your local telephone book. For details on Kemp Inert Gas Generators, write for Bulletin I-10.

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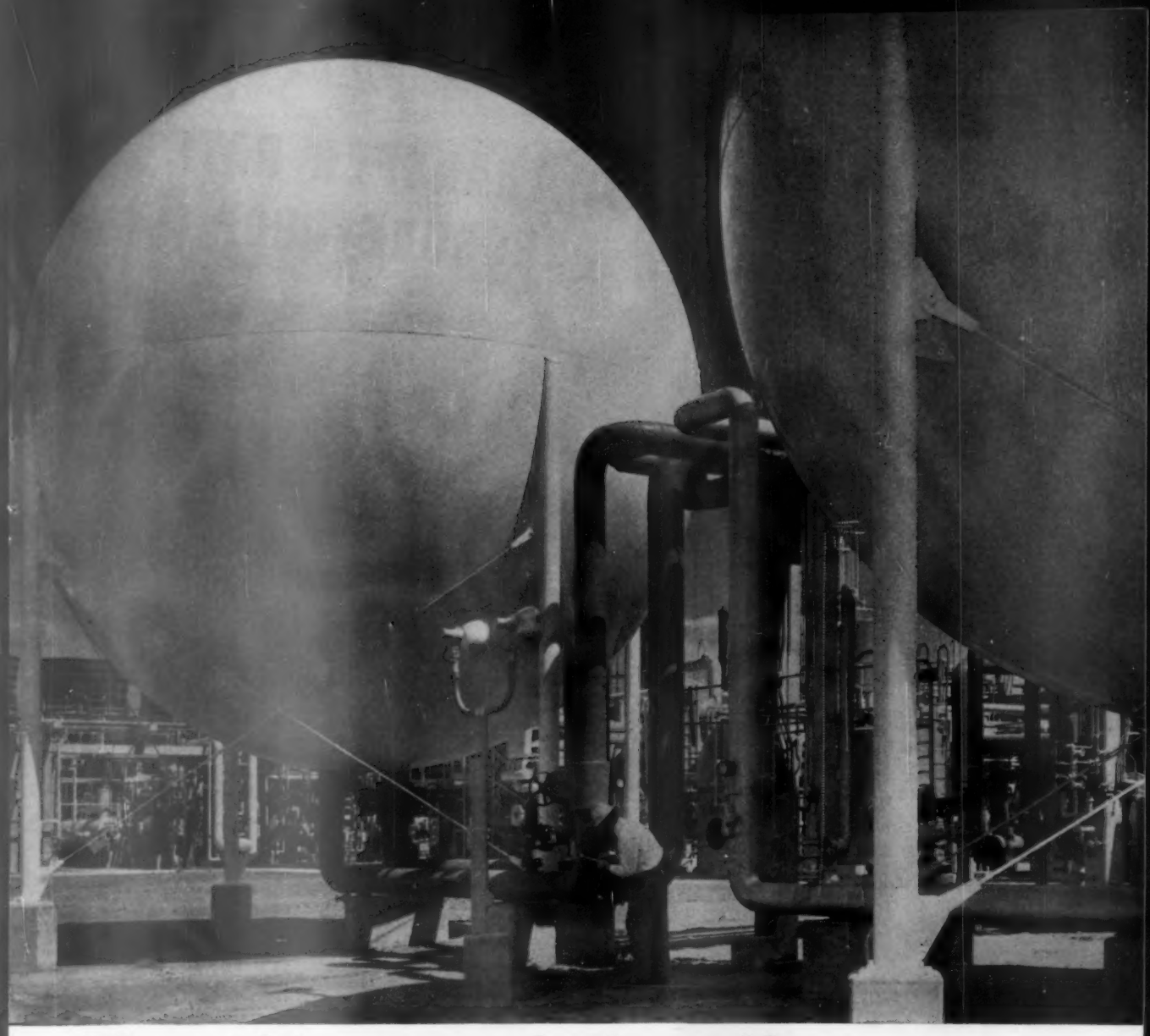

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TOP: *Muddy well water is the coolant for these Jacket Water Coolers.*

RIGHT: *Two 56" Dia. x 12'0" high Amine Solution Coolers with expansion joints in shell.*

BOTTOM: *One of a number of seawater cycle units for a chemical plant. Nylon distributing ferrules prevent adherence of barnacles. Low pressure drop allows circulation of large quantity of seawater.*

Special metering distributors control the flow in vertical Vogt film type exchangers of single tube-pass design. The liquid is spread in a uniform film over the inside surface of the tubes. Since the liquid falls by gravity, good velocity is obtained with a small quantity of liquid.

Vogt has developed many types of distributors which are made from a variety of materials to accommodate the fluids circulated through the tubes in specific processing operations.

A unique feature of these exchangers is that the tube side can be cleaned while in operation.

Vogt Film Type Exchangers are used as Coolers, Condensers, Absorbers, Heaters, and Evaporators.

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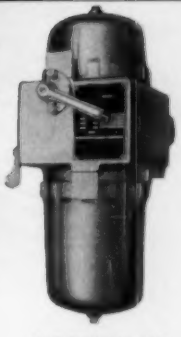
COMBINATION STARTERS IN Explosion-Proof ENCLOSURES

Here's Allen-Bradley's Bulletin 713 combination starter with circuit breaker—featuring conveniently removable explosion-proof cover and base—for use in hazardous gas and dust locations. Inside you'll find the time-tested A-B Bulletin 709 solenoid starter.

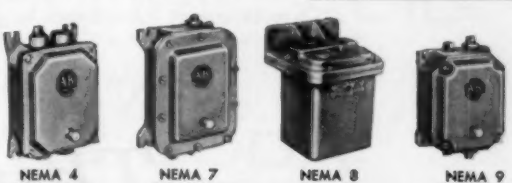
The consistent reliability of Allen-Bradley solenoid starters is a result of their design simplicity. With only ONE moving part, there's virtually nothing to go wrong—this is your assurance of millions of trouble free operations. In addition, the double break, silver alloy contacts are *always* in perfect operating condition—and remain so with *no* service attention. Also, all A-B starters have two permanently accurate thermal relays that protect motors against dangerous overloads. The reliability of these relays is not affected by atmospheric conditions or the length of time in service.

To insure maximum production with minimum maintenance, insist on Allen-Bradley *quality* motor control. Please write for full information.

Cutaway of Enclosure
Shows Allen-Bradley combination starter. Cover and base unscrew to permit quick access to the starter or the circuit breaker.



A-B Bulletin 713
Combination Starter



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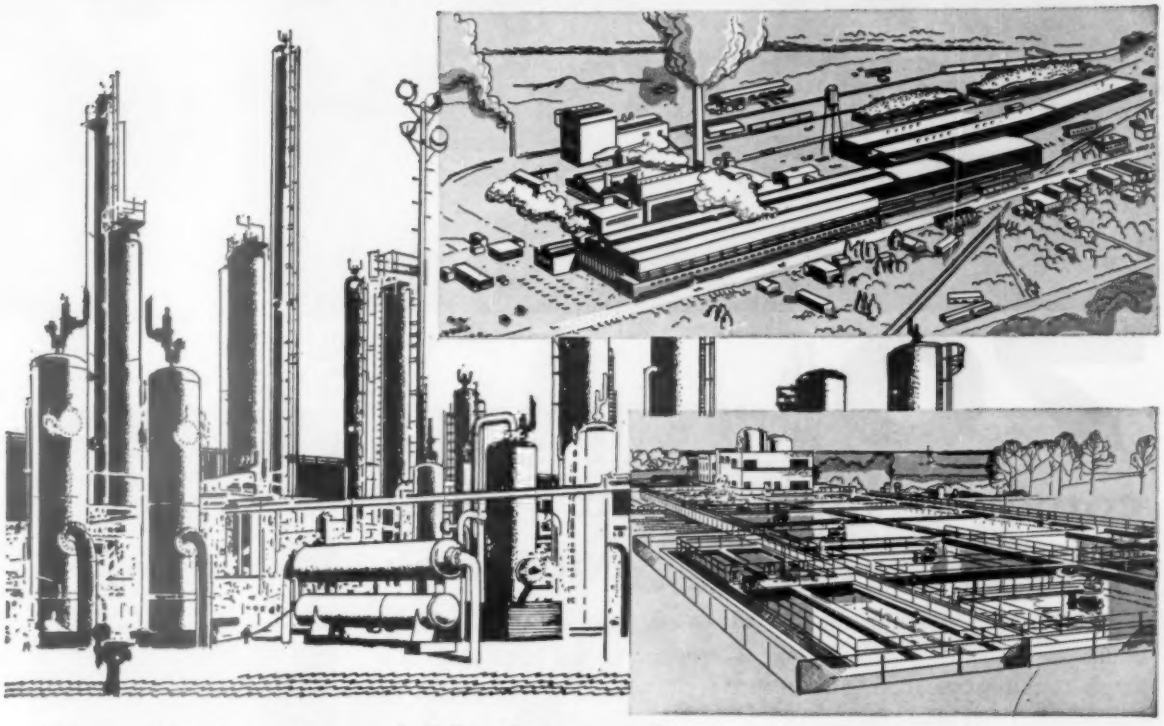

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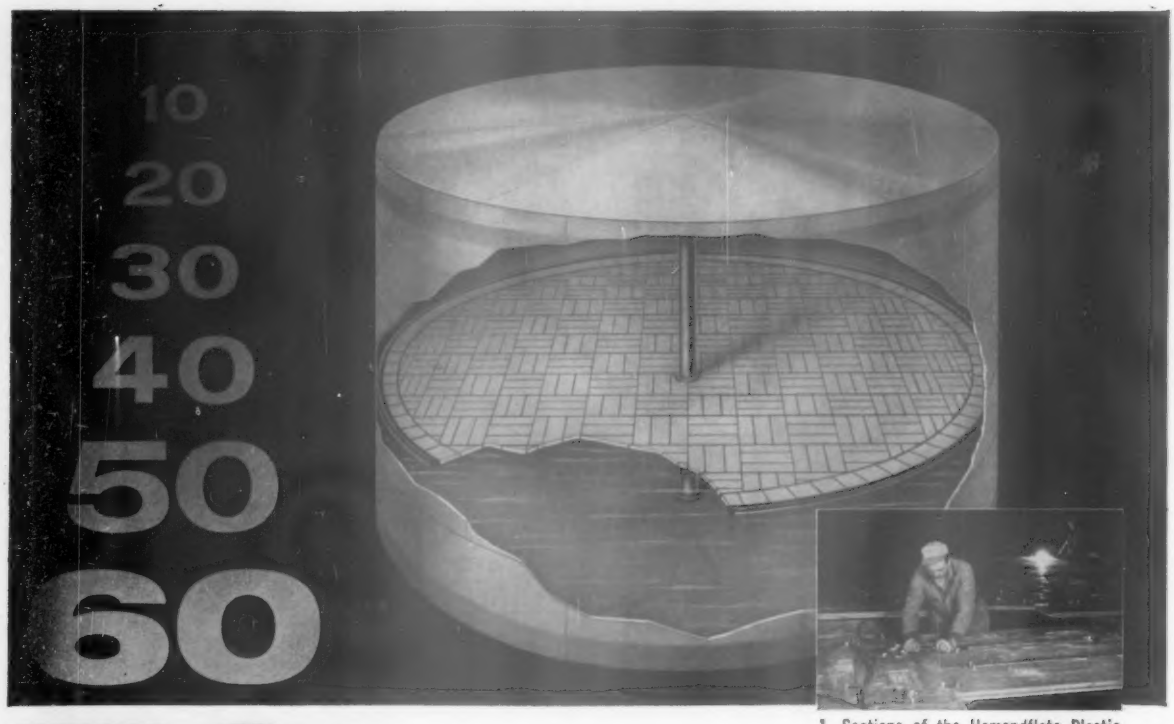

70 ft. HAMONDFLOTE COVER

converts old riveted vessel to modern floating roof tank

A rigid foam plastic Hamondflote Cover was quickly and easily installed in this 70 ft. diameter riveted tank. Using conventional hand tools in a simple assembly operation, maintenance personnel converted the vessel to an efficient conservation tank.

SIZE IS NO LIMITATION . . . the Hamondflote Cover can be used to modernize tanks up to any diameter in use today, regardless of the number or location of supporting columns. It reduces evaporation losses by as much as 95%, is completely resistant to a wide range of chemicals and petroleum hydrocarbons and will withstand temperatures from −94°F. to +300°F.

Write for bulletin which tells the entire Hamondflote Cover story.

1. Sections of the Hamondflote Plastic Cover are easily put together with tongue and groove joints and simple hand-tightened clamps.

2. Here the 70 ft. Cover is almost completed. Note that it is strong and rigid enough to support the workman's weight.

3. Rivets, columns and other protrusions on the inside wall of the tank present no problems. The flexible packing gland easily slides over them when the roof is rising or falling with the liquid level.

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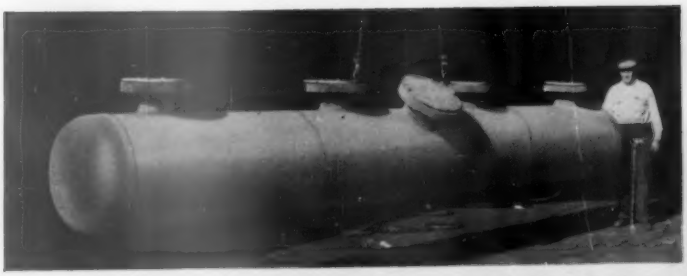
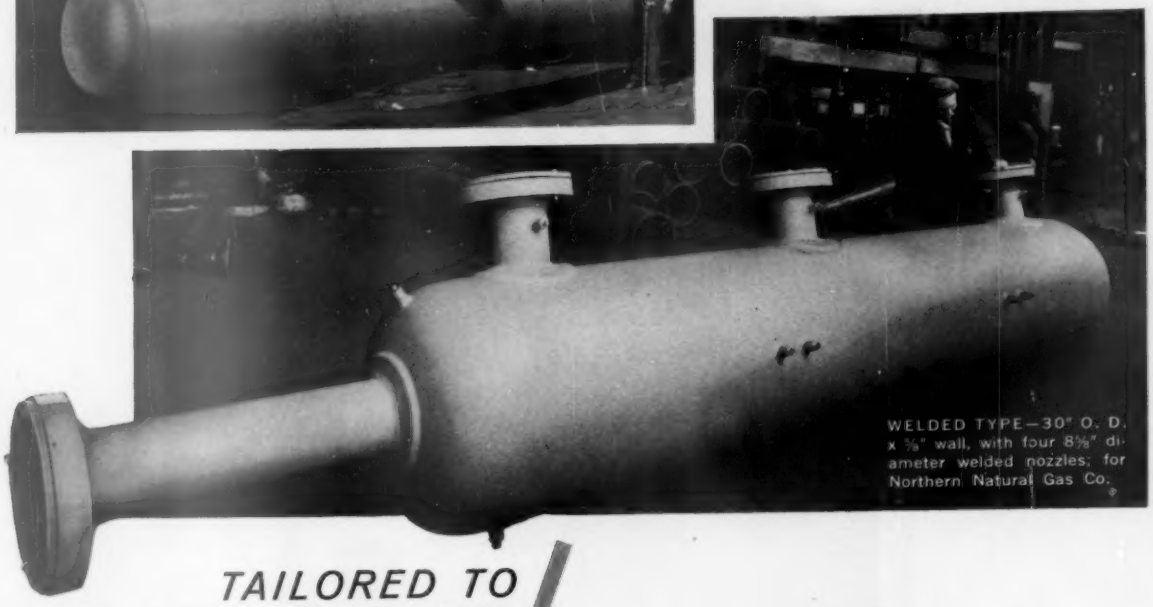


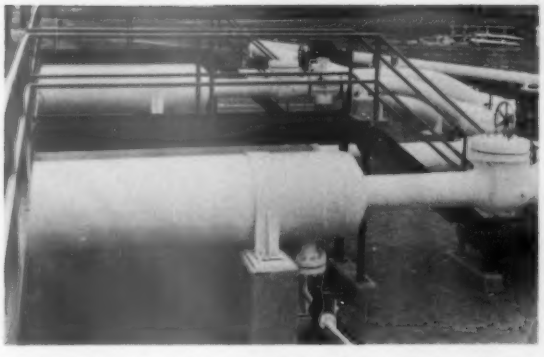
EXTRUDED TYPE—30" O. D. x 1¼" wall, with four 8" and one 12" diameter extruded nozzles; for Peoples Gulf Coast Natural Gas Pipeline Co.



WELDED TYPE—30" O. D. x ⅜" wall, with four 8⅝" diameter welded nozzles; for Northern Natural Gas Co.

TAILORED TO YOUR REQUIREMENTS

MIDWEST PULSATION DAMPENERS



Midwest—fabricated 34" pulsation dampener installed at Texas Gas Corporation's compressor station at Slaughters, Kentucky.

In any size or wall thickness, for operation at pressures up to 900 pounds or more, in Tri-Ten, A-212-B steel or any other weldable metal / Welded nozzle or extruded nozzle construction / Fabricated to code requirements / Excellent quality—long life / Dependable delivery—four fabrication plants across the nation. Send us details for quotation on your pulsation dampener requirements.

TODAY! Write for NEW bulletin 60-C describing Midwest Seamless and Welded-type fittings.

MIDWEST

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1450 South Second Street • St. Louis 4, Mo.

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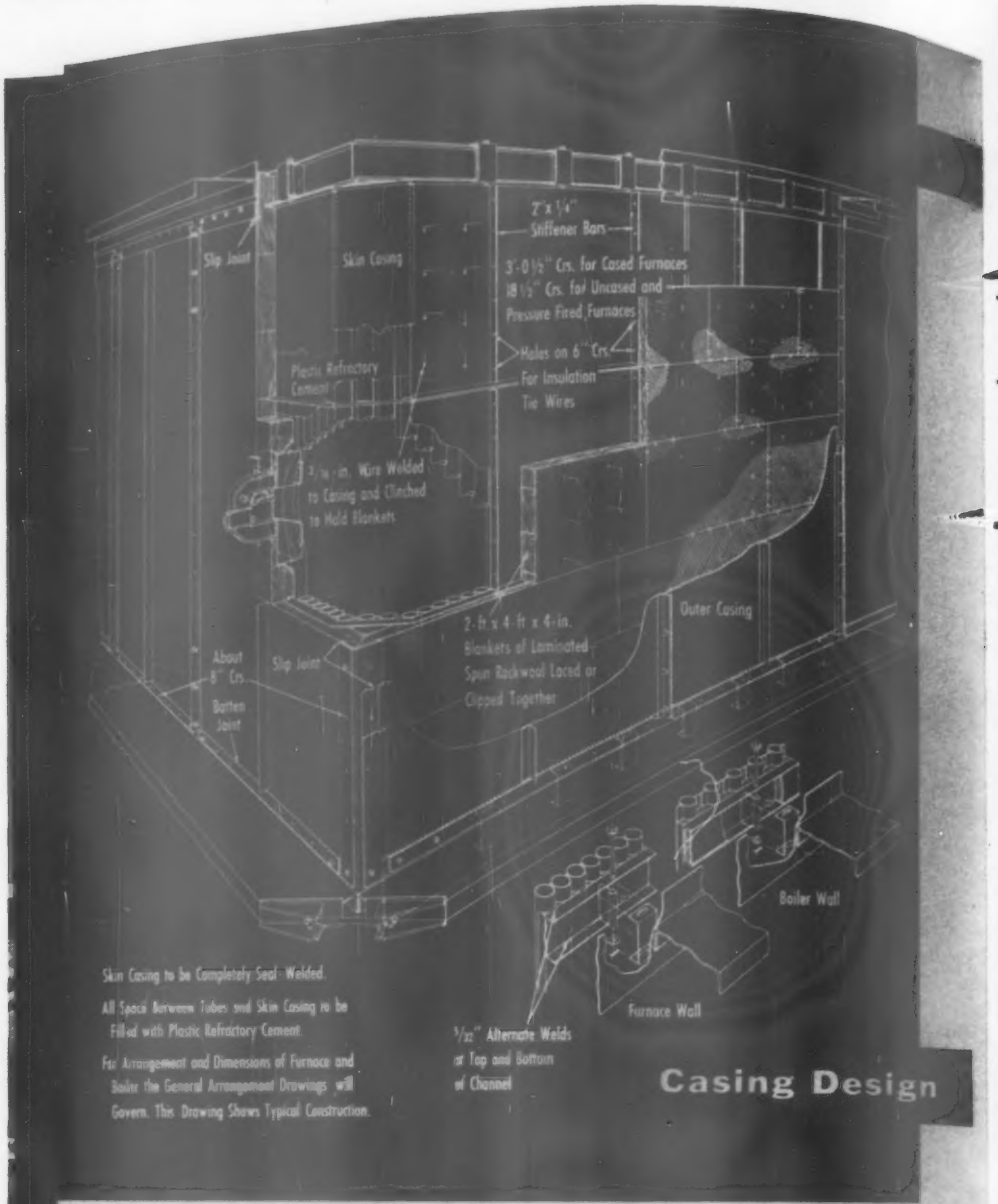
2" x 1/4" Stiffener Bars
Slip Joint
Skin Casing
3'-0 1/2" Crs. for Cased Furnaces
18 1/2" Crs. for Uncased and Pressure Fired Furnaces
Holes on 6" Crs. For Insulation Tie Wires
Plastic Refractory Cement
3/16-in. Wire Welded to Casing and Clinched to Hold Blankets
Outer Casing
2-ft x 4-ft x 4-in. Blankets of Laminated Spun Rockwool Laced or Clipped Together
About 8" Crs.
Slip Joint
Batten Joint
Boiler Wall
Furnace Wall
Skin Casing to be Completely Seal-Welded.
All Space Between Tubes and Skin Casing to be Filled with Plastic Refractory Cement.
For Arrangement and Dimensions of Furnace and Boiler the General Arrangement Drawings will Govern. This Drawing Shows Typical Construction.
3/32" Alternate Welds at Top and Bottom of Channel
Casing Design

FIG. 7.—*Details of construction for pressurized furnaces for C-E Boilers designed for waste regenerator gas firing.*

6

For the whole fact-filled catalog, write . . .

20-PAGE C-E CO BOILER CATALOG

C-E Design for CO Boilers

Combustion Engineering CO Boilers are of advanced design, yet conventional in appearance, and use the time-tested C-E Tangential Burner in the four corners of the furnace. They require no specialized or complicated means to burn the lean, moist, toxic gas from a catalyst regenerator. Utilization of furnace volume is so efficient that combustion rates of over 40,000 Btu per cu ft and higher are practical.

These boilers are designed for pressurized furnace operation. The absence of induced draft fans assures minimum air pressure loss and fan horsepower requirements.

The double-cased furnace wall construction with inner (skin) casing welded to tangent wall tubes is designed for cubical expansion of pressure parts. With the skin casing in intimate contact with the tubes, its temperature at any point is the same as that of the tubes. Thus, though the entire furnace expands cubically, there is no relative expansion between the tubes and the skin casing. For this reason the skin casing can be completely welded. This construction is carried over to the [illegible] economizer side walls where the tubes are finned. The conventional rectangular furnace allows the preferred arrangement of boiler and superheater with uniform heating surface and gas-passage area per foot of furnace width. It also provides relatively quiet burner positions, assuring positive, stable ignition. Further, the rectangular shape permits an efficient system of platforms and stairways for observation and access. Heating surfaces are disposed to recover the maximum amount of heat with a minimum of baffling. The gas velocities through the boiler are high enough to prevent excessive settling out of catalyst, yet sufficiently low to avoid excessive erosion.

At a specified steam output, the circulation conditions in a CO boiler, when firing regenerator waste gas and auxiliary fuel, are entirely different than when firing auxiliary fuel alone. For this reason, the circulating system of C-E Boilers using these fuels is designed to handle the flows of water and steam for both these extreme conditions. Furthermore, the drum internals are designed to maintain the specified purity regardless of the fuel fired.

Either a C-E continuous finned tube economizer or a vertical tube, drum-type economizer is located after the boiler section. The finned economizer is normally selected when substantial quantities of supplementary fuel will be fired and higher efficiency can be justified. The vertical tube, drum-type is a more compact design suitable for minimum load CO boilers.

A notable feature of the C-E design is the unique arrangement of integral by-pass and [illegible] seal tanks in the lower portion of the stack. These tanks provide for safe, quick changeover from the stack by-pass to the burner supply duct. No by-pass stack with additional connecting ducts and breeching is required for handling the flow of the waste gas.

C-E Boilers for firing waste gas from catalytic regenerators are completely coordinated units combining boiler, furnace setting, fuel burning and forced draft equipment. This provides the extra advantage of having one contract, one guarantee and one responsibility. They are not necessarily the lowest in first cost, but the economies accruing from superior design, construction, reliability and overall operating cost will quickly offset any price difference between the least expensive boiler and the Combustion Engineering CO Boiler.

The fact that C-E Boilers have been selected to meet the exacting performance standards of so many of the nation's largest electric utility power stations is evidence of the design and construction you can expect to find in any boiler, large or small, that bears the Combustion name plate.

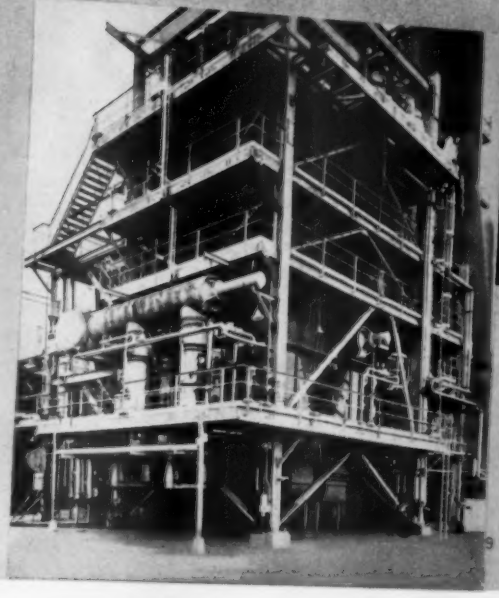

FIG. 8—C-E Boiler for waste regenerator gas firing in an oil refinery on the West Coast. The sectional side arrangement of this boiler appears on page 8.

C-290

COMBUSTION ENGINEERING

210 Madison Avenue, New York 16, N. Y.

GO
CHEVROLET
IV-1987

CHARLIE OWEN STAKES HIS WHOLE OPERATION ON CHEVY'S STAMINA AND TORSION-SPRING RIDE

C. L. Owen, vice-president of GO Oil Well Service, Fort Worth, puts his faith and $15,000 worth of electronic equipment in his Chevy panel and sends it out on rugged oil field duty every day of the week. They used to have to pad the sensitive electronic recording panel to cushion out road shock and vibration. But not any more. Not with torsion springs soaking up bumps and jolts. Chevy's new ride is "made to order," according to Charlie Owen. "In our oil well locating operation we stay on the go anywhere, any time . . . and count on less breakage along with lower maintenance costs." The GO company goes for Chevy 100%. Driver John MacPherson says, "The '60 Chevy's ride and handling are really slick. You'd think this truck had power steering."

■ They're speaking right up, these owners of '60 Chevrolets, talking about a new truck build that's the best yet at putting out extra dollars'-worth of profit-producing work every day. And you'll be talking, too, once you turn these Chevy advancements loose on your money runs!

New truck-and-tire-saving ride that leads to shorter trip times, too. The biggest advance in trucking in years: independently suspended front wheels that step right over bumps, virtually eliminate most of the severe impacts that can wear out trucks and tires before their time. You profit by a big savings on maintenance; get a bigger daily work output because these trucks float you over rough roads with fewer slow-downs. And the tough torsion bar springs assist further in soaking up shocks before they can do any damage.

New longer lasting cab construction . . . new comfort that boosts driver efficiency. You'll find that drivers stay fresher, work better in a new Chevy cab. There's more leg room, head room and hip room than ever before, new visibility that's greater by more than 26%, new foam-padded seat, new see-at-a-glance instrument panel. And new cab construction features—double-panel roof, box-section door pillars and many more—will help keep your Chevy on the road years longer.

Tough truck power that knows the most about saving money. Efficient Chevy short-stroke V8's that range from 160 h.p. all the way up to 230 h.p., offer as much as 335 ft.-lbs. of torque for toughest going. Or America's most widely used truck 6's, engines that do more work per dollar with time-proved, truck-built components. Look into it for yourself; Chevy's totally new working ability is available at your Chevrolet dealer's right now. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

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For quality equipment, longer service, reduced final costs, call on your local J&L Supply man.

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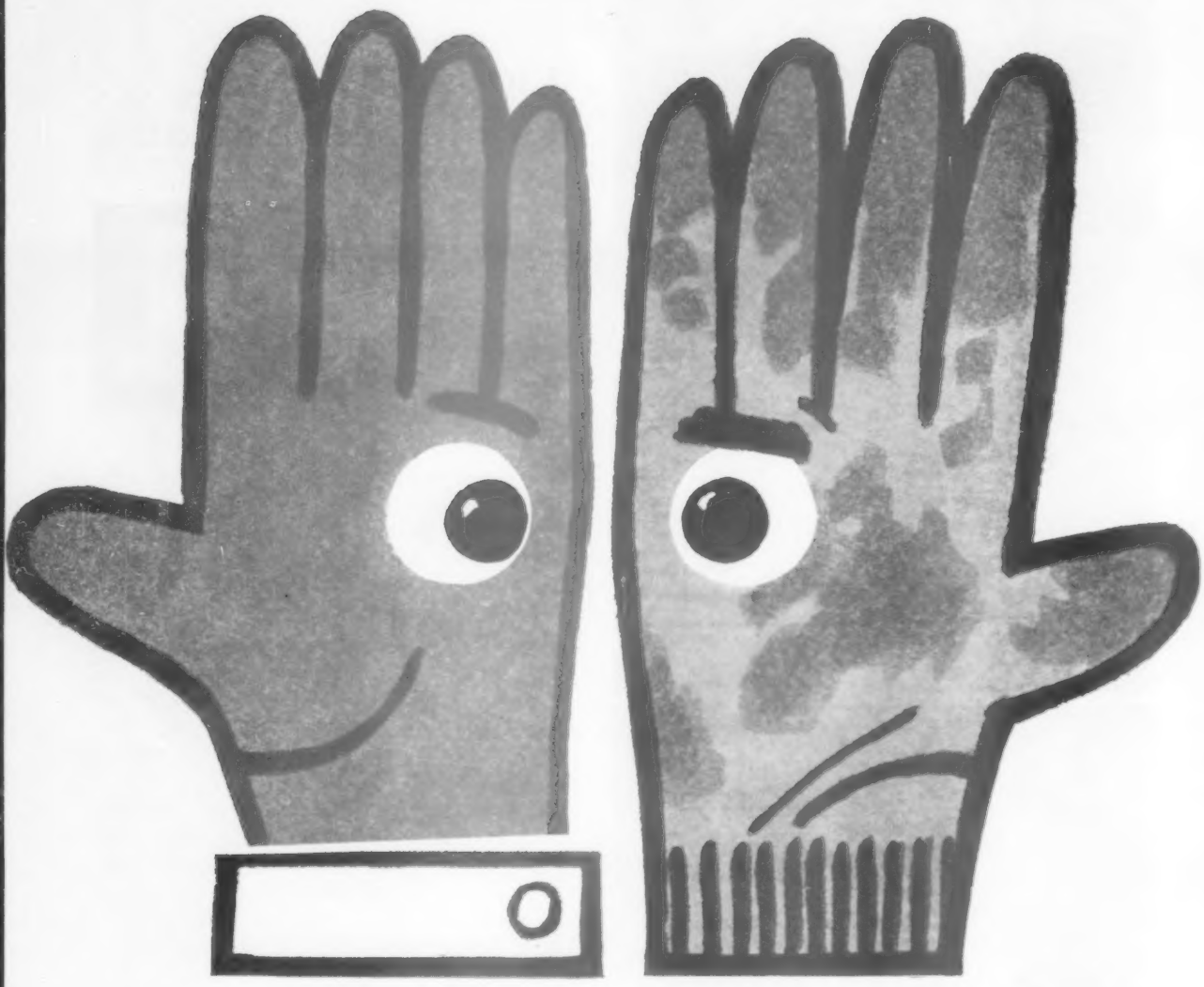

Does the right hand know what the left hand is buying?

Many times in mud buying the smiling left hand is happy because it is concerned only with the mud bill. And that can be kept low. But, a low mud bill often means low drilling efficiency. And that makes the right hand unhappy because it is concerned with keeping the *total* drilling operation efficient and economical.

An inadequate mud system can be responsible for a great deal of unnecessary expense in drilling an oil well. It can cause extra round trips, more bits. It can mean a slower rate of penetration, and time wasted in conditioning the mud. Poor mud can even damage the productive zone.

If these things happen on your wells with a fair degree of consistency, why not review the way "your hands" buy drilling mud. A well planned Magcobar mud program *may* cost a little more than a *cheap* mud program (although it will likely cost even less), but it can and will reduce your over-all drilling cost. It may even help you increase your production!

A *cheap* mud program may be the most expensive single item on your wells. A Magcobar planned mud program, on the other hand, assures the right use of the right products, makes full use of the money-saving advantages of Magcobar Technology. So, why not get all of your hands working towards the same objective? Let Magcobar plan with you to get the best wells at the lowest *total* cost.

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OIL • GAS • CHEMICAL
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Progress in the "petro-chemical future" depends on the Engineering Specialist

Engineering, especially in the petro-chemical industry, is undergoing a metamorphosis of great significance . . . for as processes and applications become more complicated and definite, there emerges the demand for the qualified expert in the various phases of this complex industry — a real need for engineering specialists.

Western's recognition of its "petro-chemical future" — more than a dozen years ago — put the manufacture of Western heat exchangers under the critical scrutiny of specialists in the fields of design, thermal rating, metallurgy and mechanical engineering. The responsibilities entrusted to their care by our customers is testimony to the expertness of their work . . . and they merit your confidence, too.

WESTERN'S STAKE IN YOUR FUTURE

Upon the shoulders of the specialists—schooled, trained and experienced in specific phases of research, design, fabrication and operation of process equipment and methods — rests the responsibility of future development. Emphasizing the value of such specialization is the next of Western's "professional-advancement" messages, shown at right, now being carried in leading chemical and petroleum trade journals . . . available in more complete detail in pamphlet form, upon request.

One of a series appearing in OIL & GAS JOURNAL, CHEMICAL ENGINEERING, PETROLEUM REFINER, REFINING ENGINEER, CHEMICAL ENGINEERING PROGRESS.

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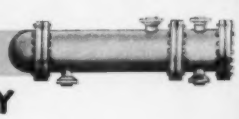

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The rapid, even meteoric development of the petro-chemical industry in the past decade has enhanced the role of importance played by engineering specialists with each step of its progress. Today, the engineer who is equipped with knowledge, study, training and experience in some specific phase of the processing cycle finds himself in an extremely favorable position and nowhere is this more obvious than in the realm of process engineering and estimating.

Frank Friedli, *Manager,*
En-Tronic Controls Division,
The Cooper-Bessemer Corporation,
explains...

How Cooper-Bessemer En-Tronic® Controls operate compressor station 26 miles away

This electronic control at Robinson Station transmits the signals for completely automatic remote control of the Columbiana Station 26 miles away. It receives and charts data from that station and provides an alarm and lights to indicate conditions at the remote station. All this is carried by a single line.

A part of the gas stored for East Ohio's customers is handled by their Columbiana Station. Here, they have recently replaced a 40-year-old engine-driven compressor with a Cooper-Bessemer GMXD 660 hp Packaged Compressor and En-Tronic Control. This entire installation operates automatically by push-button control from the Robinson Station 26 miles away.

A single telephone line and tone equipment provide a series of frequencies which control all operations... automatic sequencing, system alarms, data reporting, opening and closing of plug valves in the station piping, instantaneous shutting down of compressor in case of failure of power or communications and automatic starting when services are restored, and all other control and regulating functions. The compressor is self-lubricating.

The Cooper-Bessemer equipment makes possible better utilization of skilled operators, greater dependability of control, and a considerable economy in operation.

Why not investigate remote control for your compressor stations... both new and modernized. Call on us for help in evaluating the possibilities.

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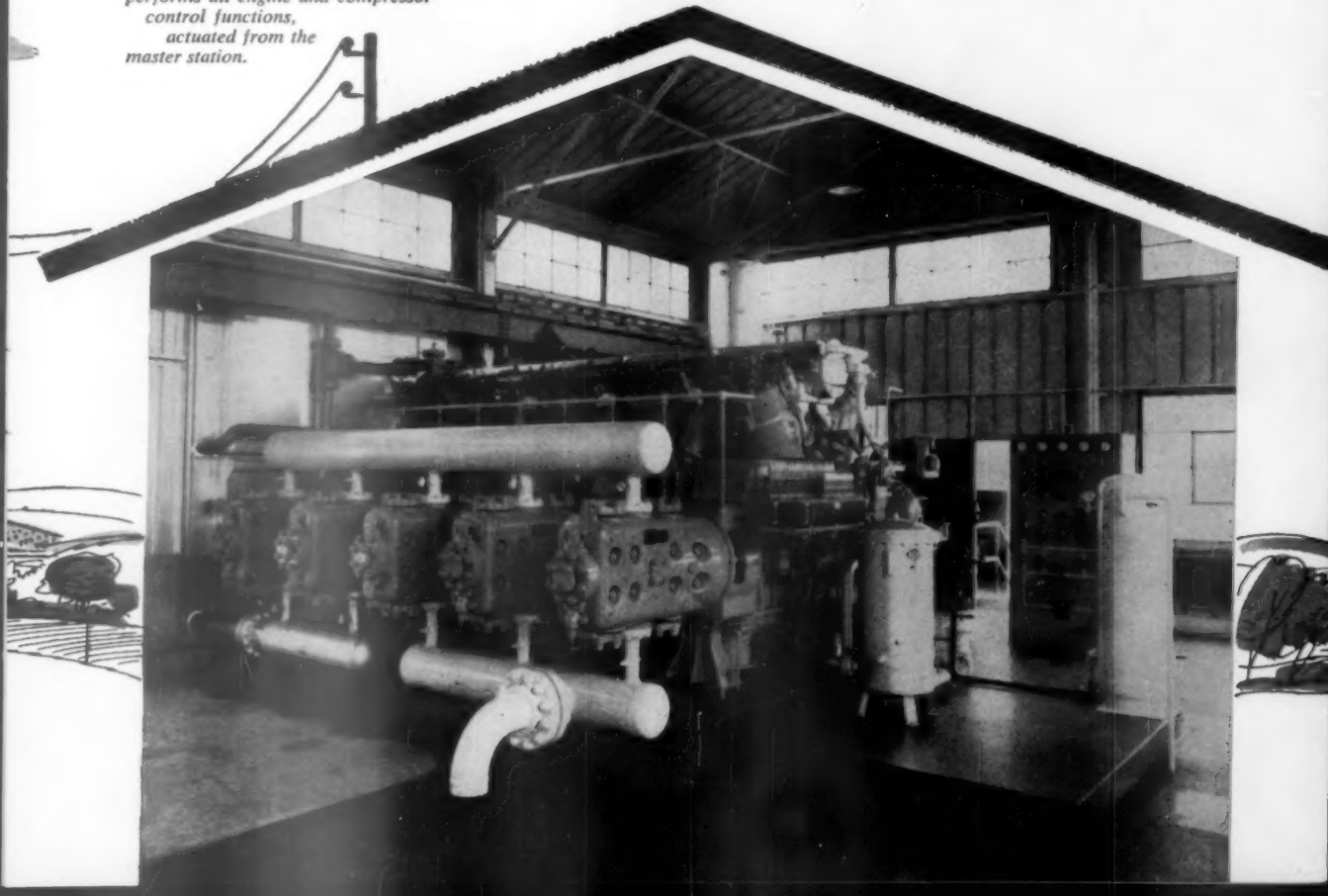
Foreground: Cooper-Bessemer GMXD-10 660 hp Packaged Compressor at Columbiana Station. Background: Cooper-Bessemer En-Tronic Control which performs all engine and compressor control functions, actuated from the master station.



42,000 FEET OF X-TRU-COAT FOR UNITED REFINING COMPANY

New 4" line connects refinery to tank farm

United Refining Company's new plastic-coated pipeline replaces a conventional bare line.

United Refining Company, Warren, Pennsylvania, chose X-TRU-COAT for corrosion-resistance, for ease of installation, and for overall economy. They have found that the pipe is not subject to electrolysis nor is it damaged by water-soaked ground. The 42,000-foot pipeline was installed in less than four weeks by an eight-man crew with a side-boom tractor and back-hoe. Pipe was buried three feet below the surface (just below the frost line).

X-TRU-COAT's high density polyethylene coating resists shipping, stringing, and backfilling damage. It is extruded over a special Republic bonding compound that prevents underfilm migration. After welding, exposed joints are wrapped with primed, pressure-sensitive plastic tape that is homogeneous with the polyethylene coating.

Republic X-TRU-COAT* merits your investigation. Utilities have capitalized on more than 28,000,000 feet of this factory-coated line pipe in less than three years.

*Produced under the DEKORON® Process and available now in 1.050" to 8.625" OD.

SAVED TIME AND MONEY: Western Electric utilized plastic pipe for an intricate, 30-acre lawn sprinkling system at their Oklahoma City telephone accessories plant. Republic Steel supplied 21,460 feet of 1¼" through 3" SRK® Plastic Pipe rated at 100 psi. Installed by Southwest Irrigation Company, the system called for 53 different watering circuits to operate four at a time. A clock-like device—designed by Southwest Irrigation—completes a sprinkling automatically in approximately 16 hours. Send for data on SRK Plastic Pipe.

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STEEL DRUMS AND PACKAGES: A complete service in *20-to 55-gallon drums* including Light Gage Class I.C.C.—17E, 17H, 17C, 6J; Heavy Gage Class I.C.C.—*5, 5A, 5B, 5C, 17F,* and certain I.C.C.—6 Series. Choice of plain, decorated, hot dip galvanized, hot dip tinner, lacquer lines, or in ENDURO® Stainless Steel. A full line of steel packages in 3½- to 20-gallon capacities—26- to 20-gage plain steel—lined and decorated to specification.

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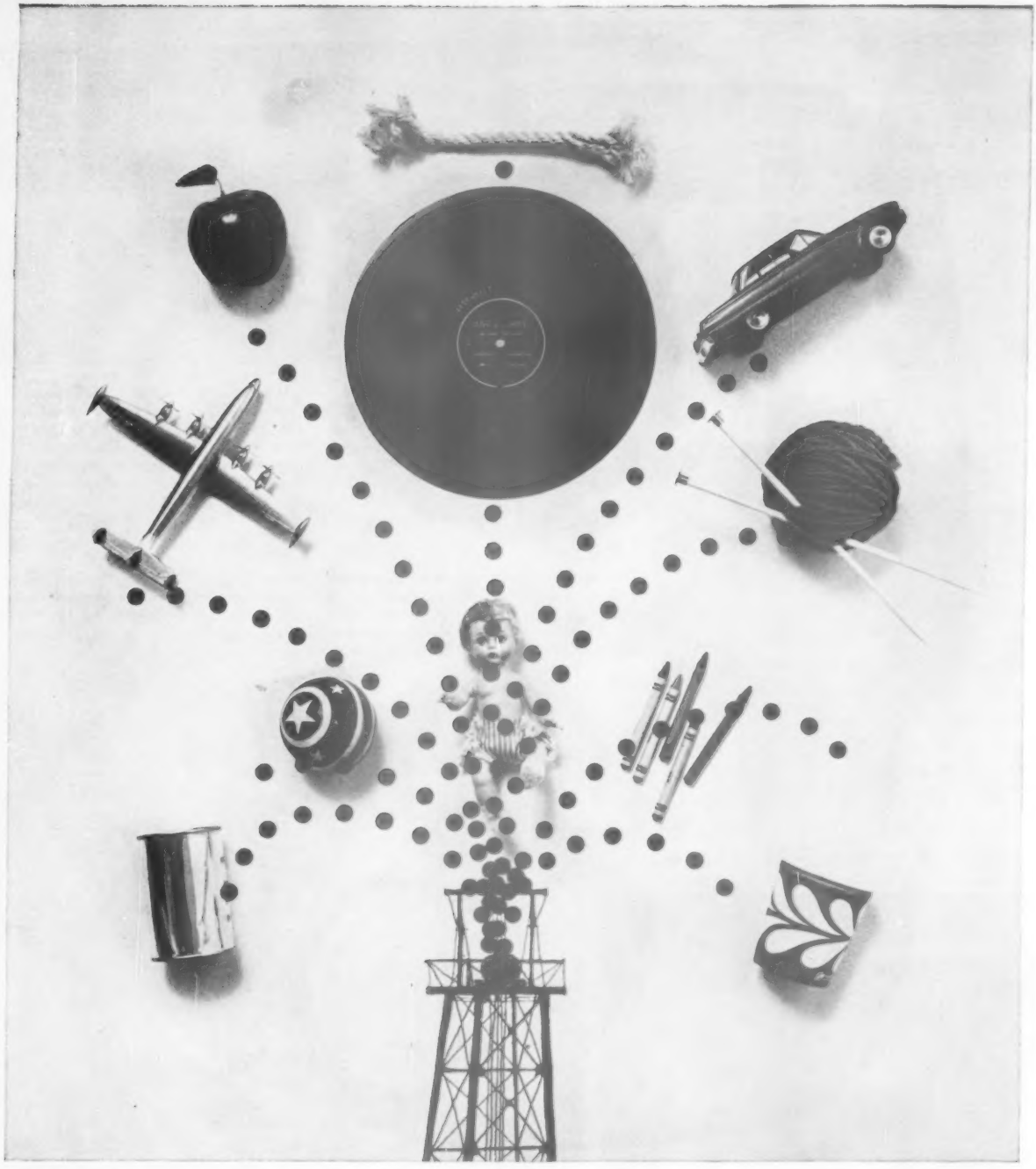

"Finding *brand new* uses for oil products is important. Oilmen have relied on inventive people outside the industry to develop uses for our products. It's about time we did something substantial along these lines ourselves."

—M. J. Rathbone, President

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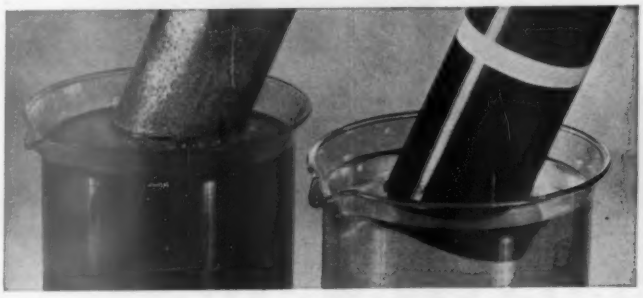
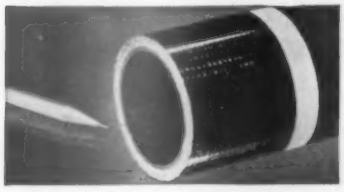
Standard Oil Company (New Jersey)



TEST PROVES CORROSION RESISTANCE . . . Stainless Steel 316 pipe (at left) and Fibercast Pipe were tested in 54% P_2O_5 solution at 290° F using modified ASTM A-262-55T formula. The stainless steel pipe showed .778" penetration per month; yet the Fibercast showed no deterioration whatsoever.

FIBERCAST® epoxy pipe solves critical problems in petrochemical industries!

Petrochemical industries discover that new Fibercast Pipe and Fittings give superior performance indefinitely . . . in corrosive elements and under high pressures and temperatures, too!



SOLVES DIFFICULT PIPE PROBLEMS

The unique pipe and tubing problems of the petrochemical industries have given Fibercast an exceptional opportunity to prove its long-term, cost-saving value. Not only does it offer superior resistance to corrosion, heat and pressure . . . it is also outstanding for its ability to maintain the purity of the solutions it carries.

WITHSTANDS FIRE DAMAGE

Fibercast has demonstrated its ability to withstand severe fires without adding to combustion or permitting further bursts or explosions. It has successfully met fire test specifications ASTM D-635-44 and LP-406 (Fed.) Test Method 2021.1 as "self-extinguishing" and "non-contributing."

LIGHTWEIGHT, EASY TO HANDLE, STRONG

Light weight makes Fibercast easy to use; (it is less than 25% the weight of steel.) Yet it has the same basic linear coefficient of expansion as steel and can be used on pipe racks with span lengths generally used for metal pipe.

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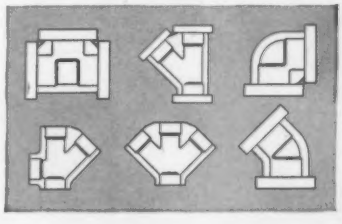
Fibercast stocks fittings to solve difficult fitting problems too. Choose from a vast stock of standard sizes and types . . . or have special fittings designed and made to fit your individual needs.



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Despite its many advantages, (corrosion, pressure and high temperature resistance), Fibercast is an outstanding cost-saver because it is long-lasting and virtually maintenance-free. Moreover, replacement costs are also substantially reduced. Compare Fibercast costs to stainless steel, Saran lined and rubber hose. See *why* it's the best buy for *you!*

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Powell engineers and metallurgists will gladly make a special analysis of your requirements and submit recommendations to fill all your valve needs. Write directly to us . . . or consult your local Powell distributor.

Powell . . . world's largest family of valves

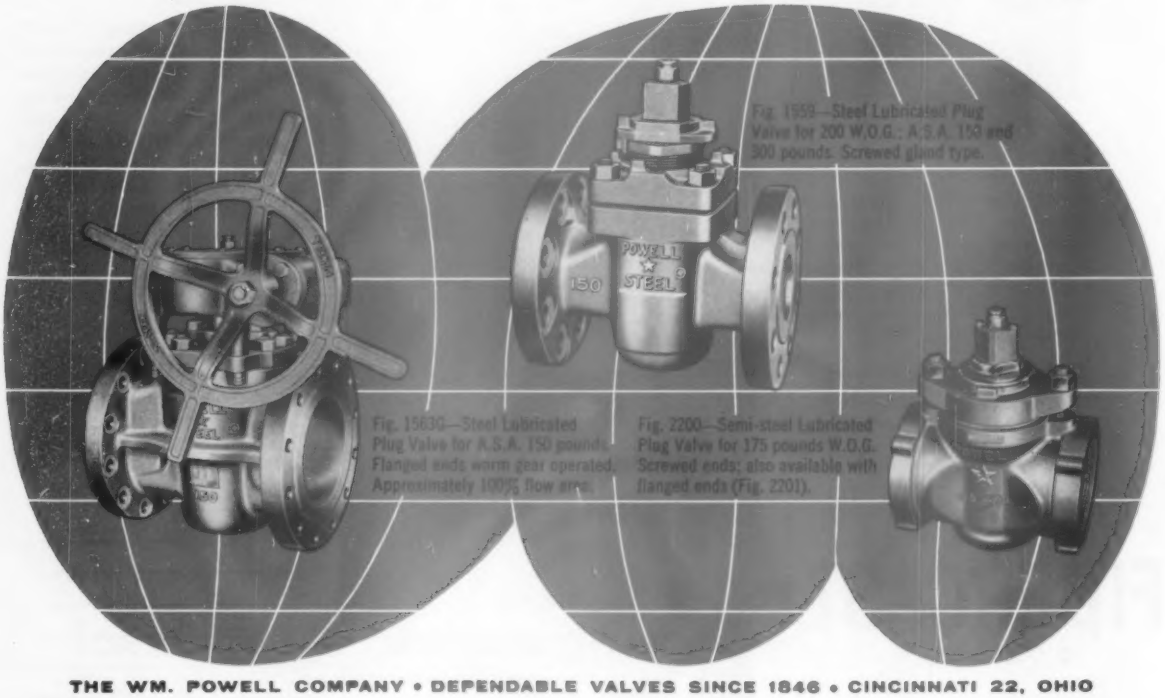


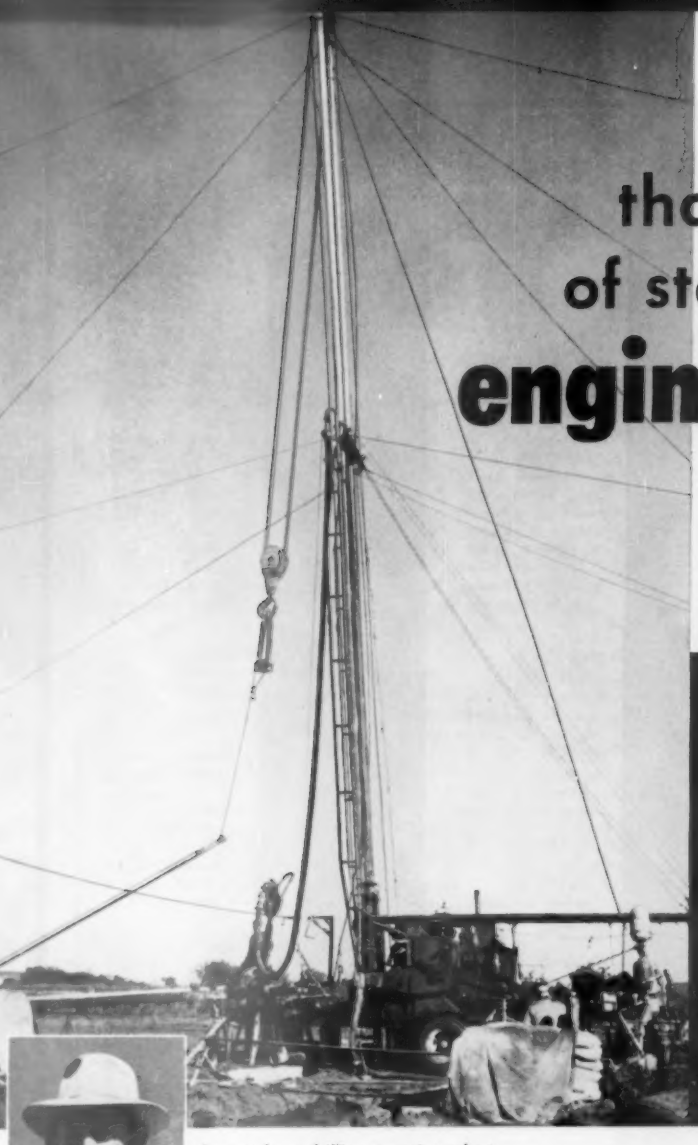
Fig. 1959—Steel Lubricated Plug Valve for 200 W.O.G.; A.S.A. 150 and 300 pounds. Screwed gland type.

Fig. 1563G—Steel Lubricated Plug Valve for A.S.A. 150 pounds. Flanged ends worm gear operated. Approximately 100% flow area.

Fig. 2200—Semi-steel Lubricated Plug Valve for 175 pounds W.O.G. Screwed ends; also available with flanged ends (Fig. 2201).

THE WM. POWELL COMPANY • DEPENDABLE VALVES SINCE 1846 • CINCINNATI 22, OHIO

After more than 15,000 hours of steady operation engine still runs like new!



UV-549 V-8 engine 257 max. hp @ 3,400 rpm gasoline, LP gas or natural gas.

Report from drilling superintendent, W. F. Hicks

"Since December, 1957 this International V-8 has run almost continuously, 24 hours a day, supplying the smoothest, most efficient power a driller ever had. When we had a chance to take the head and pan off after more than 11,000 hours operation, we couldn't find any wear that could be measured, felt, or seen. Since then we have drilled another 75,000 feet of hole, and added 4,454 hours of operating time on this engine. And it still runs like new!"

A three-man crew handles this specially built rig for Davis & Davis, Inc., Coleman, Texas. The pipe is racked horizontally on a platform instead of in a vertical stack, and this eliminates the tower man from the four-man crew normally used on this size operation. It takes them about five days, working three shifts around the clock, to put down an average well of 2,300 feet. The International UV-549 powers draw works, rotary table and cat head.

International oil field engines are adaptable to meet your needs. Choose fuel attachments for natural gas, combination natural gas and gasoline, LPG, or dual fuel—LPG and natural gas. Water cooled exhaust manifold, top cylinder oiler, automatic safety shut-off, oil sight level gage, low-tension magneto, and gear-driven mechanical governor are available. Check with your International Power Unit Distributor or Dealer for drill, pump and compressor power. Choose from 24 engines—16.8 to 385 max. hp.

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They Say—

Mistaken map

Dear Sir:

Having lived the first 18 years of my life in Wisconsin, there are many things about the "Badger" State that are dear to me.

Although I have not visited the state for over 12 years, it now looks like I will be unable to do so, since I find that Minnesota has either usurped the State of Wisconsin or Wisconsin has been sold to Minnesota.

Please refer to the illustration on page 123 of the August 8 issue ("New Trenton Extensions Boost Michigan Production," by Robert E. Ives).

Please tell me that I can go "home" again at some time in the future.

J. E. Hockings
Sales Service Manager (gas)
Mueller Co.
Decatur, Ill.

Dear Sir:

It's been quite a while since I've visited my home state of Wisconsin, but I'm quite certain that in that time it hasn't been annexed by Minnesota.

Is Mr. Ives that confused about his neighboring states, or is it one of those deep-south draftsmen working for the OGJ?

W. J. Fratt
Sohio Petroleum Co.
Calgary.

Dear Sir:

Could it be possible that Robert E. Ives has been misinformed on his geological survey as he has been on his geography as shown on the accompanying map?

C. K. Carruthers
Service Tools, Inc.
New Orleans

Dear Sir:

I noticed two rather noticeable mistakes. First, the contour map on the base of the Trenton-Black River formation has the State of Minnesota where Wisconsin normally is.

Another error is in the Albion field map. The brief cross-section indicates the Black River is below the Salina group. It should be below the Trenton.

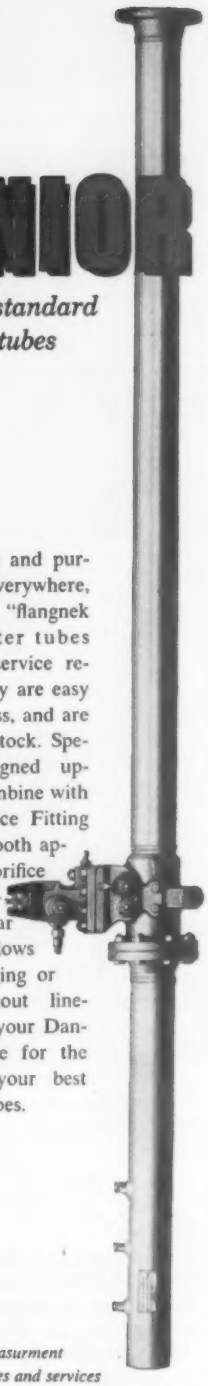
I'm bringing this to your attention because these errors are quite evident and will be directly attributed to me.

Robert E. Ives
Petroleum Geologist
Michigan Department of Conservation

Editor's note: Don't blame Author

SENIOR

flangnek standard meter tubes



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Write for Daniel Catalog Section "D"

163

Ives. The maps were redrawn by the Journal's art department mapmakers, who are blushing over both errors.

One way to skin the cat

"In order to reduce burdensome inventories of both crude oil and refined products and bring supply into balance with demand, there would have to be either a reduction in imports or a further reduction in domestic production.

"I believe domestic producers have done more than their share and that the imports of both crude oil and products should be cut.

"Temporarily, the public might have to pay more for petroleum products but long range there would be savings to the public through the elimination of uneconomical marketing practices."

Everett F. Wells, president, Ashland Oil & Refining Co., in a speech to the eastern district meeting of API's Division of Production.

Case for integration

"The relatively low return in the refining, pipeline, and marketing divisions is one of the great problems confronting the company. We have 35% of our funds invested in these divisions.

"Since return on investment is comparatively low in refining and marketing, the question naturally arises, 'Why should we be in this business?' and especially, 'Why should we have such a large portion of our funds invested in this business?'

"This is largely a matter of philosophy. It is our belief that a company in the oil business which intends to grow must eventually get into refining and marketing and become a balanced, integrated company.

"This reduces the risk of drastic pressures on the income in any one segment. If you are going to be in the refining and marketing business, it is essential that you get in on a large enough scale that you can be competitive. This requires a tremendous investment."

Dean A. McGee, president Kerr-McGee Oil Industries, Inc., in a report to Kermac employes.

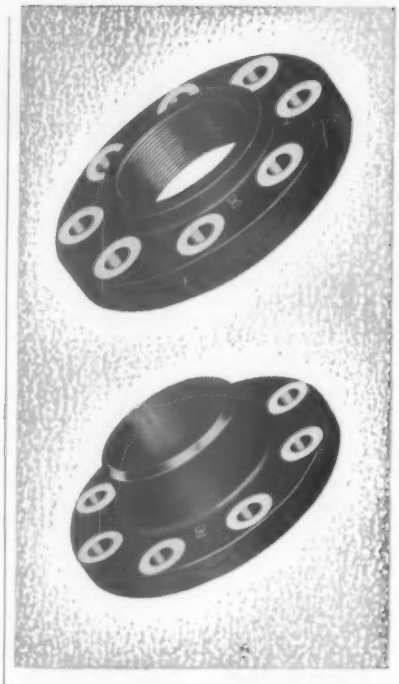
Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

SEPTEMBER

6-7 Chemical Institute of Canada, organic chemistry division conference, Edmonton.

7-9 American Society of Mechanical Engineers, joint automatic control con-



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Harrisburg Drop-Forged Steel Pipe Flanges are made to A.S.A. standards for oil companies, ship builders and pipe fabricators. They come in threaded, butt-welding, slip-on welding, Van Stone and blind types and are shot-blasted and dip-coat finished with a rust preventative black lacquer. Be sure you make it Harrisburg when you want flanges.

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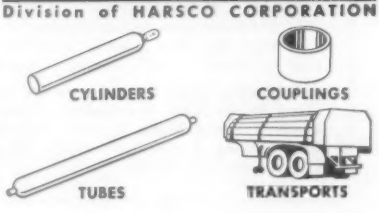

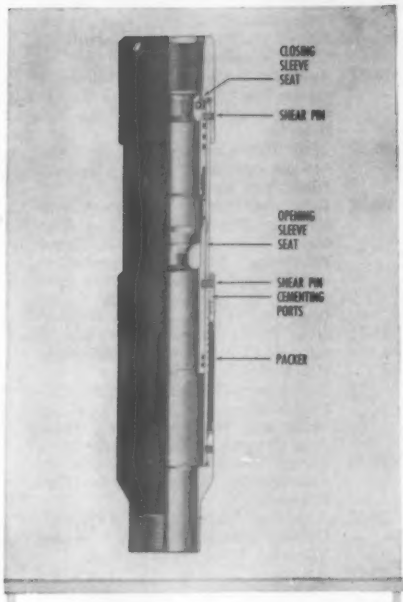

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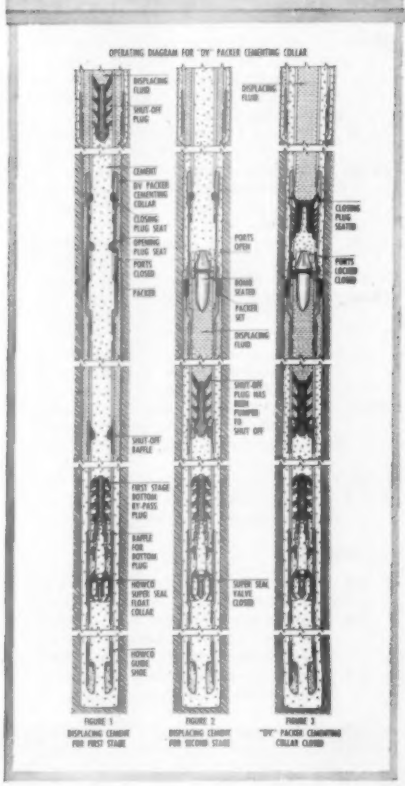
A NEW COMBINATION CEMENTING TOOL

THE HALLIBURTON "DV" PACKER CEMENTING COLLAR

Halliburton has designed a new tool that retains all the features and advantages of the "DV" Multiple Stage Cementer . . . plus a rubber pack-off element that eliminates installing one or more cement baskets on the casing below a regular type "DV" Cementer.



HERE ARE SOME OF THE APPLICATIONS FOR THE NEW "DV" PACKER CEMENTING COLLAR:

- Cementing between a high pressure gas zone and lost circulation zone.
- Cementing above a lost circulation zone.
- Where formation pressure of intermediate zone is greater than hydrostatic head of cement.
- When second stage of cement is to be placed a large distance up the hole from top of first stage cement and a packer is required to support cement column.
- Full hole cementing of slotted or perforated liners.

The New Halliburton "DV" Packer Cementing Collar consists of steel opening and closing sleeves, cementing ports and a rubber sleeve type packer which expands out against the bore hole or casing to form a seal as the tool is opened prior to second stage. The operation is accomplished by plugs, seats and sleeves. When job is completed, the slotted cementing ports are closed by an internal steel sleeve . . . which is moved down by pump pressure applied to the closing plug that seats on top of the closing seat. Closing sleeve holds cement in place behind casing string and is locked closed by two snap rings.

Call your local Halliburton Representative for further technical data about this *new combination packer cementing collar.* Available in 4½", 5½" and 7" sizes. Most other sizes made available on special order for your requirements . . . call today!

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ference, Massachusetts Institute of Technology, Cambridge, Mass.

7-10 Billings Geological Society, annual field trip, Hebgen Lake-Madison Valley area of southwestern Montana.

8-9 National Research Council, Chemical Institute of Canada, tenth Canadian high polymer forum, Alpine Inn, Montreal.

8-9 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

8-10 Chemical Institute of Canada, western regional conference, Regina.

8-10 Intermountain Association of Petroleum Geologists and Eastern Nevada Geological Society, field trip, economic geology of east-central Nevada.

11-13 New Mexico Petroleum Industries Committee, annual convention, Western Skies Hotel, Albuquerque.

11-16 American Chemical Society, national meeting, New York City.

14-15 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

14-16 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

14-16 National Industrial Conference Board, eighth annual marketing conference, Waldorf-Astoria Hotel, New York.

15 Natural Gasoline Association of America, Rocky Mountain regional meeting, Palliser Hotel, Calgary.

15-16 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual engineering management conference, Morrison Hotel, Chicago.

16-17 Kansas Geological Society, twenty-fifth annual field conference, northeastern Oklahoma, Western Hills Lodge, Wagoner, Okla.

18-21 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Jung Hotel, New Orleans.

19-21 Texas Mid-Continent Oil and Gas Association, annual meeting, Granada Hotel, San Antonio, Tex.

20-21 Illinois oil industry convention, sponsored by Illinois Oil and Gas Association, Illinois Oil Council, Illinois Petroleum Marketers Association, and Chicago Gasoline Jobbers Association, St. Nicholas Hotel, Springfield.

20-21 Ohio Petroleum Marketers Association, fall conference, Netherland-Hilton Hotel, Cincinnati.

21 American Petroleum Institute, Coalinga-Kettleman chapter, annual barbecue and golf tournament, Polvadero Country Club.

21-23 Pacific Coast Gas Association, annual meeting, Westward Ho Hotel, Phoenix.

25-27 American Association of Oilwell Drilling Contractors, annual meeting, Roosevelt Hotel, New Orleans.

25-28 American Institute of Chemical Engineers, meeting, Mayo Hotel, Tulsa.

25-28 American Institute of Electrical Engineers, petroleum industry committee, electrical conference of the petroleum industry, Hotel Skirvin, Oklahoma City.

26-29 American Welding Society, fall meeting, Penn-Sheraton Hotel, Pittsburgh.

26-30 Instrument Society of America, instrument-automation conference and exhibit, and fifteenth annual meeting, Coliseum, New York.

27-29 Mid-West Gas Association, annual school and conference, Memorial Union, Iowa State College, Ames.

28-30 University of Oklahoma and National Association of Corrosion Engineers, central Oklahoma section, seventh annual corrosion control short course, North Campus, University of Oklahoma, Norman.

29-30 Mid-Continent Oil and Gas Association, Mississippi-Alabama division meeting, Grand Hotel, Point Clear, Ala.

29-Oct. 1 West Texas Geological Society, field trip, Delaware basin of West Texas and southeast New Mexico.

OCTOBER

2-5 Society of Petroleum Engineers of AIME, annual fall meeting, Denver.

3-4 Independent Natural Gas Association of America, annual meeting, Fontainebleau Hotel, Miami Beach.

4-5 University of Kansas, gas-measurement institute, National Guard Armory, Liberal, Kans.

5 Society of Plastics Engineers, Inc., regional technical conference, Mark Hopkins Hotel, San Francisco.

6-7 National Association of Corrosion Engineers, annual western region conference, Sheraton-Palace Hotel, San Francisco.

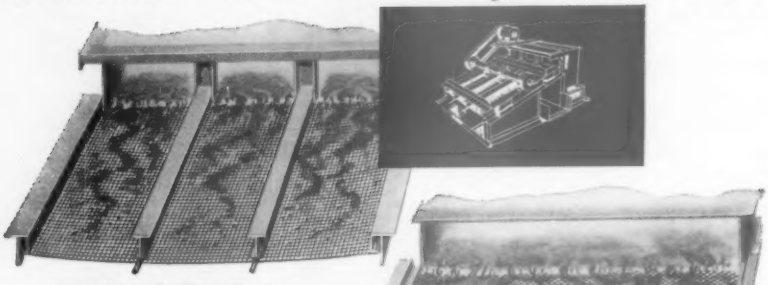
6-8 National Association of Corrosion Engineers, southeast region conference, Dinkler-Plaza Hotel, Atlanta, Ga.

6-8 National Academy of Sciences, National Research Council, ninth national clay conference, Purdue University, Lafayette, Ind.

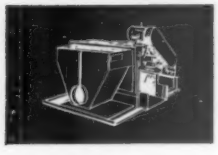
10-12 American Gas Association, annual convention, Atlantic City.

11-14 National Association of Corrosion

here's why "RUMBA" is the most efficient shale shaker you can own



"RUMBA" Under-Slung Screen.



Conventional Over-Slung Screen.

"RUMBA" is the only shale shaker that evenly distributes the drilling fluid over the entire screening area. This gives you a more effective separation of cuttings with a high rate of flow.

"RUMBA" is the only shale shaker equipped with an under-slung screen cloth. The heavy steel struts above the screen: 1) Provide 20 lineal feet of rigid driving surface; 2) Prevent whipping or flexing of the screen; 3) Control distribution of drilling fluid over the screen.

"RUMBA" is the only shale shaker equipped with a De-Sander and a Sample Catcher. Hutchison Manufacturing Company's patented De-Sander removes tons of sand. Effects substantial savings in the maintenance of pumps, swivels, and other equipment!

"RUMBA" Shale Shakers are quality-built for years of dependable service. The first "RUMBA" Shale Shaker built is still in operation after 22 years of efficient service. If you want the most efficient shale shaker you can buy, *specify* "RUMBA".

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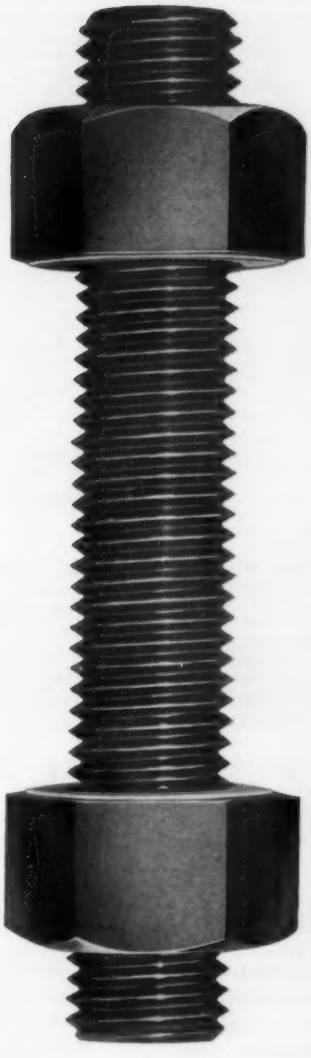

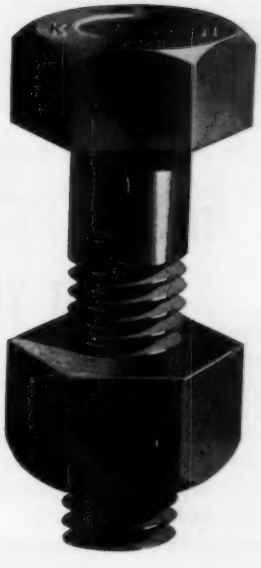

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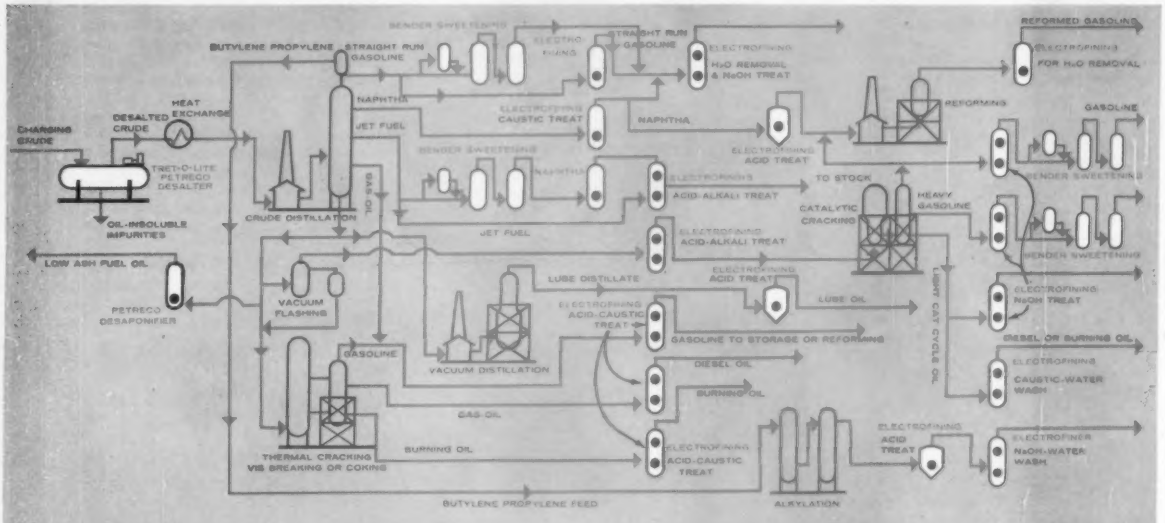

This flow diagram shows how Petreco equipment can be applied to various refining problems to improve product quality at minimum investment. (1) PETRECO* Electric Desalting or TRET-O-LITE* Chemical Desalting units purify charging crude. (2) ELECTROFINING* Precipitators perform a variety of distillate treating operations. (3) PETRECO-BENDER Catalytic Sweetening Process treats distillates in the No. 2 fuel-kerosine-gasoline range to provide a sweet, non-corrosive product. (4) PETRECO Lube-Acid Treating provides continuous, automatically-controlled, acid treatment for lubricating oils and similar stocks in a closed non-air-polluting system. (5) PETRECO Desaponification Process removes about 85% of the ash-forming constituents from fuel stocks, enabling them to be marketed advantageously or used as charging stock for cracking.

Other Petreco purification processes available but not shown in the diagram include units for dehydration and sediment separation.

Impurity removal is much too important to be provided for as an afterthought...

Include PETRECO PROCESSING EQUIPMENT in your Basic Refinery Design

Although PETRECO processing equipment can be installed at any time, the most effective installations are those provided for in *the refinery's initial planning stage*. When desalting and purification units are planned as integral parts of the basic refinery design, impurity removal and product treatment can be accomplished more efficiently. Space can be better utilized, pipe and pump requirements can be reduced, fewer and smaller vessels can be used, and construction costs held at minimum.

Also, planning purification and treating installations at the preliminary design stage allows adequate time to determine exact equipment needs. The Petreco engineering staff is always available for consultation. Call on Petreco for help with *any* purification or treating problem, whether it's on the drawing board or in an operating refinery.

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AR-60-1

Engineers, northeast region conference, Prichard Hotel, Huntington, W. Va.

12-14 Southwestern Federation of Geological Societies, annual meeting, Wooten Hotel, Abilene, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Hotel Miramar, Santa Monica, Calif.

13-15 Southwestern Legal Foundation, American Association of Petroleum Landmen, second national institute for petroleum landmen, Dallas.

13-16 Taft, Calif., Oildorado, fiftieth anniversary celebration.

14-15 University of Texas, E. P. Schoch lecture series on rate processes, Batts Hall Auditorium, Austin.

14-16 New Mexico Geological Society, annual field conference, Chama basin of northern New Mexico, registration, Taos, Oct. 13.

17-19 American Society of Mechanical Engineers, American Society of Lubrication Engineers, lubrication conference, Statler Hilton Hotel, Boston.

17-19 University of Minnesota, Pennsylvania State University, Colorado School of Mines, biannual symposium on drilling and blasting, Golden, Colo.

17-Nov. 5 University of Oklahoma, School of Petroleum Engineering, short course in advanced drilling practices for engineers, University of Oklahoma, Norman.

19-20 National Association of Corrosion Engineers, north central region conference, Schroeder Hotel, Milwaukee.

19-21 Gulf Coast Association of Geological Societies, convention, Biloxi, Miss.

19-21 Rocky Mountain Oil and Gas Association, annual convention, Brown Palace Hotel, Denver.

20-21 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

20-23 Permian Basin Oil Show, Odessa, Tex.

23-25 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

24-25 American Society of Mechanical Engineers, American Institute of Electrical Engineers, fuels conference, Daniel Boone Hotel, Charleston, W. Va.

25-28 National Association of Corrosion Engineers, south central region conference, Mayo Hotel, Tulsa.

26-27 Armour Research Foundation of Illinois Institute of Technology, computer applications symposium, Morrison Hotel, Chicago.

26-27 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

31-Nov. 4 University of Oklahoma, petroleum landmen's institute, Student Union Building, University of Oklahoma, Norman.

NOVEMBER

3 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

14-16 Society of Petroleum Engineers of AIME, Venezuelan sections, fourth annual meeting, Maracaibo, Venezuela.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubricants conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.

DECEMBER

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

9 Tulane University, School of Law, and American Association of Oilwell Drilling Contractors, fifth annual program on mineral and tidelands law, University Center, Tulane University, New Orleans.

JANUARY

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

THE RACE BELONGS TO THE SWIFT

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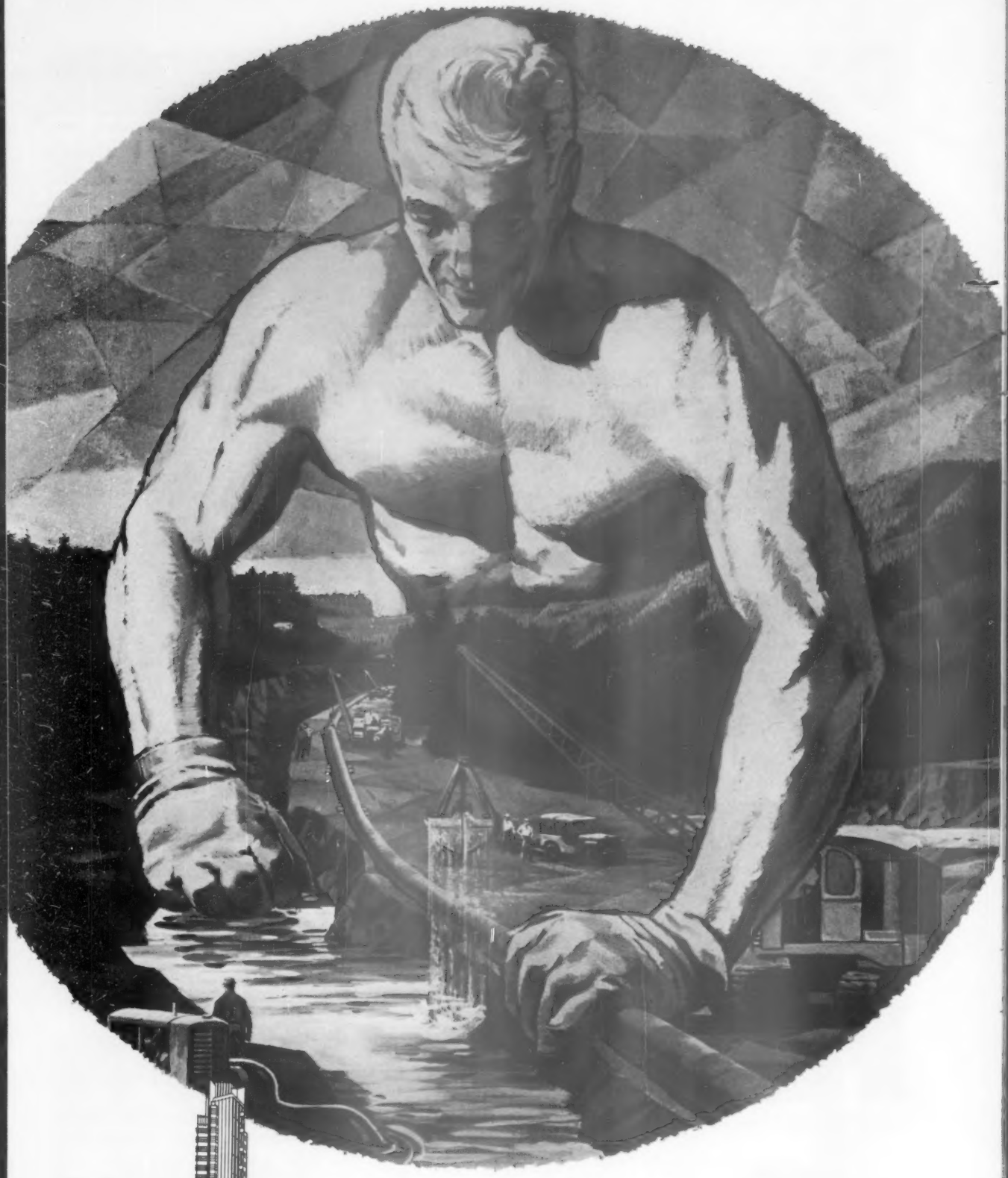

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the Journal said...

50 years ago

September 8, 1910

New gushers push booming Caddo field in northwestern Louisiana to the country's No. 1 spot in production with daily average output last week at record high of more than 53,000 bbl. Producers Oil Co.'s 12 Levee Board flows steadily at 19,000 bbl. daily as the field's biggest well. Trees Oil Co.'s No. 27 blows in for 5,000 bbl. daily while the crew is away for lunch.

The Texas Co. is taking the lead among oil companies in turning to wireless communication. Wireless equipment is being installed on the roof of its 10-story Jones office building at Houston. Similar equipment will be provided at Port Arthur and Shreveport. Messages can be exchanged between any of these points, and also with vessels of the company's fleet.

25 years ago

September 5, 1935

Reductions in California crude-oil price postings ranging from 3 cents a barrel on lower gravities to 63 cents on the higher gravities follow a complete breakdown of the state's proration program. Central Committee of California Oil Producers, official oil-curtailment group, folds up temporarily. Crude with gravity of 31° and above posted at 46 cents.

Organization by Phillips Petroleum Co. of Polymerization Process Corp. to handle patent licenses adds importance to this company's new polymerization method of making premium-grade gasoline from refinery and natural gases. Exchange of patents gives The Texas Co., Standard Oil Co. (Indiana), and Standard Oil Co. (New Jersey) interests in organization.

10 years ago

September 7, 1950

American International Fuel & Petroleum Co., Gulf Oil Corp. subsidiary, obtains concession of 100,000 hectares in southeastern Sicily. It is the first concession issued under the new Sicilian petroleum law.

Work begins on Platte Pipe Line Co.'s new $60,000,000, 1,080-mile, 20-in. crude-oil pipeline from the Rocky Mountain region to the Wood River refinery area in Illinois. Five-company joint project to be completed in 12 to 18 months.

Discovery of five oil and gas-producing areas in Denver-Julesburg basin stretches productive trend more than 90 miles across southwestern Nebraska and northeastern Colorado. Major producing province and widespread development play foreseen.

JOURNALLY SPEAKING

Drug Stores in Gas

WE NEARLY popped a gusset when we read that a chain drug store is teaming up with a gas pipeline in a joint manufacturing venture.

What could two such outfits possibly have in common? Drug retailing and gas transmission! Now we've heard everything!

Of course we soon doped out that in a general way the answer must be connected with that magic word "petrochemicals." And further reading made it clear that the thing these two have in common is something known as polyolefins.

Rexall Drug Co. and El Paso Natural Gas Co. are jointly building a petrochemical plant at Odessa, Tex., to produce polyolefins and to conduct research on same.

Further inquiry among people who know about such things elicited the intelligence that polyolefins consist of polyethylenes and polypropylenes and that these are the base for making the kinds of plastics that are so widely used in making packaging films and nonbreakable bottles.

Also that polyethylenes and polypropylenes are made from ethylene and propylene, which are made from ethane, butane, and propane, which in turn are made from the liquid hydrocarbons that come to the surface along with natural gas from the wells and which have to be squeezed out before the dried gas can be moved in long-distance pipelines.

So after we traced all these steps in both directions, the connection between these two seemingly diverse companies became quite clear. In fact, it's a natural. Rexall certainly uses lots of wrapping film and squeeze bottles, and El Paso has lots of natural-gas liquids it would like to find good uses for.

All of which just goes to show how complex and ramified this dog-gone petroleum industry is getting to be.

Oil and gas producers are now in the plastics and chemicals business, and all kinds of "outside" companies are now getting deep into oil and gas.

For example, just run your eye down the list of petrochemical projects in our survey which starts on page 116 of this issue. You'll spot names of explosives manufacturers, textile companies, fertilizer makers, sulfur companies, rubber and tire firms, farm-implement manufacturers, and a slew of others you never even heard of—and all of them with a finger in the petroleum pie one way or another.

And the things these petrochemical plants make—a polysyllabic profusion of jawbreaking names nobody in the oil business ever heard of until just a very few years ago.

As the feller says, the world do move. And this sector of the petroleum industry's world is moving a lot faster than any other. During the past 5 years the petrochemical growth rate has been more than 10% per year—which is a lot better than the rest of the oil industry has been able to do.

But this growth rate is slowing down. You will note that in the introduction to the survey our Petrochemical Editor, Hugh Pylant, says that the industry may be having its last fling before reaching maturity.

Well, it's been quite a fling, anyway. It "flang" the oil and gas business into partnership with all those other kinds of business, and vice versa, and got everybody all intertwined and interdependent. And if its coming maturity means that drug stores and dress-goods weavers, and plowshare makers and such will have a stake in percentage depletion, oil proration, and natural-gas reserves, then it could be a fruitful maturity in many respects.

One sad thing about it is that petrochemicals, for all their rapid growth and amazing diversity of new products, don't use a whole lot of our total oil and gas production—something less than 5%.

If they used a lot more, then the gas-producing states could tell Wisconsin and New England and the rest of them to go back to using manufactured gas, and the FPC could go suck its foot because we don't need any interstate pipeline market, thank you. But that time could come.

—Henry D. Ralph

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You can't run crude that isn't produced

REFINERY RUNS have been somewhat lower the past 2 weeks, and one company after another has issued statements explaining that it is cutting back its runs because stocks of refined products are high enough to take care of the anticipated fall demand.

This is a shining example of industrial statesmanship. Of course, the shine is tarnished a bit by the fact that everybody in the industry except refinery management has been shouting for weeks that product stocks are way too high and that runs should have been cut before this.

It is further tarnished by the fact that refinery operators had no choice but to cut. Determination of their operating level has been taken out of their hands.

THE NAKED TRUTH is that there just isn't enough crude oil available in the United States to permit refineries to run at the rate they had been running during July and August.

For the first time in recent history the crude-oil end of the business is in position to call the tune for the rest of the industry. Instead of refinery managers ordering their crude buyers to supply so much, the buyers are telling the operators how much crude they can expect to get.

This surprising switch was brought about by the statesmanlike policy of the Texas Railroad Commission and—at long last—by parallel action of the conservation bodies of other prorating states. These bodies have shaken off their short-sighted provincialism and are accepting the broad responsibilities of their market-demand statutes.

During the past few months these state commissions have looked at market demand from the viewpoint of national demand for refined products. They have considered refinery runs, product stocks, market forecasts, and seasonal trends. And they tailored crude allowables to fit.

The Texas commission has gone even further. It periodically requires refiners to reveal their individual crude and product stocks and to compare them with estimates of desirable levels. It publicly questions company representatives about their operating practices that have a bearing on the demand for Texas crude.

CREDIT FOR IMPROVED CONDITIONS in the oil business goes to the prorating commissions. They have worked off the crude surplus and are now attacking the product surplus. That is truly proration to market demand.

For 30 years the industry has wondered how oversupply could be curbed without federal regulation of refinery runs. And after nearly 30 years of trying, the prorating states have found a way.

These commissioners should be commended for their achievement and encouraged to continue to view market demand as a whole. And other states should be asked to join their fellows in this stabilization program.

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RESOURCES EXCEED $3,000,000,000

ONE WAY to serve the motorist when commercial facilities are barred from the right-of-way is to set up service stations on feeder roads. This has been done off U. S. 66 at Channahon, Ill., as shown in the bottom left and top right.

Super Roads—New Factor in Marketing

- The growing problem for oil men: How to best serve motorists on the U. S. limited-access highway system if you're barred from the right-of-way. One lesson being learned: Oil men must demand a voice in the planning.

Robert J. Enright
District Editor

THIS WEEK in Arkansas, members of the Arkansas Oil Dealers Association will urge the state highway commission to change the routing of U. S. 65 Expressway through Pine Bluff.

In Minnesota, the state's Petroleum Council is opposing construction of elaborate, expensive rest areas along the interstate system.

The Ohio Petroleum Council is pushing, with marked success, for a "wishbone" design for service facilities at interchanges along limited-access, interstate freeways.

In Texas, members of a newly formed Committee on Highway Development of the Oil Information Committee plan early contacts with the Texas Highway Commission to talk over common problems.

Similar efforts are under way in Michigan and a growing number of other states.

All this reflects an increasing awareness by oil men of the headaches they face in serving the motorist along the burgeoning network of limited-access super roads. Some of the problem questions are:

. . . **What is the best** way to serve the motorist with stations barred from the right of-way of such highways?

. . . **How can companies** alert motorists to station locations and the brand of gas for sale, without violating federal advertising restrictions?

. . . **What should** the frequency of access be on the super highways—5 miles, 10 miles, 15 miles? If there are too many points of access, service station business on the access roads would be diluted. If the exits and entrances are too limited, traffic would be reduced—an equally undesirable end.

. . . **How can interchanges** be designed so that autos can easily get to service stations on the feeder roads?

These are just a few of the problems inherent in serving the motorist along Uncle Sam's new interstate highway system.

Along with such close-to-home problems, the marketing end of the oil business is expected to keep its eye on such governmental activities as contract letting and right-of-way buying. It will attempt to see that past waste in the administration of the interstate network is not repeated.

In all these things, oil men feel their interest and that of the public is the same.

One big victory . . . The industry, largely through the efforts of the Committee on Public Affairs of the API, already has skirted what could have been its biggest headache connected with the federal highway program.

The industry was able to obtain in the Highway Act of 1956 a provision banning commercial facilities from the right-of-way of any highway built under the act. This will preserve the open, competitive system for the interstate system that the motoring public and oil industry now enjoy on free-access roads.

The industry already has a craw full

FORCED RELOCATION of this station at Kankakee, Ill., may be the result when the crossroad is elevated.

TEXAS PLAN of parallel service roads on super highways eases oil companies' problems by making stations visible.

of the alternative—the turnpike-type operation. Under this system where service stations on the right-of-way go as a monopoly to high bidders, a high royalty is paid on each gallon of gasoline and each quart of motor oil sold.

Notwithstanding the federal law, however, oil groups in some states are pressing for local legislative affirmation. There is some chance, they feel, that money-hungry state governments might find loopholes and attempt to dictate turnpike-like terms where highways cut through state parks, and similar government areas.

With this in mind, the Minnesota Petroleum Council worked hard and successfully last year in getting a bill through the legislature which bars commercial facilities from the right-of-way of any limited-access highway in the state.

This group and the other state organizations mentioned are affiliates of the API's Committee on Public Affairs. It is through this machinery that the industry hopes to make itself effective at the state level. Each state committee has access to voluminous statistical studies carried out by the CPA. The use that is made of these studies, however, is entirely up to the state committee.

Highway Act cloudy . . . The 1956 Highway Act appears to have solved the industry's biggest worry—the threat of possible turnpike-type operation of commercial facilities on government right-of-way—but it created many lesser ones.

The act mentions many of these, such as restrictions on advertising of commercial facilities off the right-of-way; on safety and rest areas; and the number of interchanges. But oil companies are not sure whether the specifications are law, or merely recommendations.

There are various interpretations by various state officials. Thus it is all the more important, the companies feel, that oil men be on hand at the right time to speak their piece and try to influence acceptable action by highway commissions, legislatures, and other official groups.

The newly-formed Committee on Highway Development in Texas states as its purpose: "To provide advice and assistance to industry groups and governmental agencies on problems . . . affecting the location and use of sites . . . to fill the needs of users of limited access highways for petroleum and allied products and services conveniently, efficiently, safely, and economically under a free enterprise system."

The CHD plans to:

. . . **Develop and maintain** a complete file on regulations proposed or issued by the Federal Bureau of Public Roads and state highway departments on all phases of highway planning and development that might affect petroleum marketing.

. . . **Gather and maintain** another file on the pertinent proceedings of the American Association of State Highway Officials, the National Highway Users' Conference, the U. S. Chamber of Commerce, the Asphalt Institute, the API, the American Road Builders' Association, and other similar organizations.

. . . **Interpret and analyze** existing and proposed regulations and published proceedings, to disseminate the data developed. And to work with other groups to present to the proper governmental agencies those features that affect the best interests of the public and the industry.

. . . **Cooperate** and coordinate its activities with other groups that have programs and aims within the scope of the committee.

The chairman of the committee is J. E. Niland, coordinator of marketing operations and engineering for Humble Oil & Refining Co., Houston. Vice chairman is George Gregor, general manager of the Southwest marketing division of Mobil Oil Co., Dallas.

The Texas group held its first down-to-earth meeting August 25 and expects to swing into action and make contacts with state highway officials very soon.

Limited-access to stay . . . Oil marketers are convinced that the limited-access highway is here to stay and that mileage of such roads will be a larger and larger percentage of total highway mileage in coming years.

Therefore, they feel, it is highly important that they are not hamstrung

with inequitable regulations early in the game. Such rules are almost always easier to prevent than they are to change later.

Involved in the present federal interstate program are some 40,000 miles of superhighways. So far, only about 3,700 miles have been completed. Another 3,100 are open to traffic but not yet complete.

All told, the Department of Commerce reports that 9,106 miles of the system now are open to traffic. But this includes 2,274 miles of what the department calls toll facilities—and this is cause for considerable industry concern.

Questions that arise about these pay roads include: Will present on-right-of-way commercial facilities be permitted to remain there? Can others come in? If not, doesn't this conflict with the highway act? Will royalties still be paid to the states by operators with on - the - right - of - way stations?

Though 40,000 miles of road is quite a lot, oil marketers feel that this figure is small change compared to mileage of limited-access highways that will be built in the next 25 years—not only by state-federal government cooperation but in many cases by the states alone.

This is why so much importance is attached to guiding action in the right channels now.

Phillips, Sunray Sell Their Canadian Assets

PACIFIC Petroleums, Ltd., of Calgary took a major step toward becoming a leading Canadian integrated oil company last week when it acquired all the assets in Canada of Phillips Petroleum Co. and Sunray Mid-Continent Oil Co.

Phillips and Sunray received common stock of Pacific Petroleums in exchange for their properties.

The exchange was made after a mutual evaluation of the Canadian properties of the three companies. Basis was oil and gas reserves with credit for physical properties.

The exchange will bring Pacific Petroleums' total common issue to 14,775,773 shares. Phillips will own 39% of the stock and Sunray 5.8%.

Frank M. McMahon, chairman and chief executive officer of Pacific Petroleums, estimated after the consolidation his company's assets will exceed $315 million.

What's involved . . . McMahon said the Phillips and Sunray properties will increase Pacific Petroleum's income with very little increase in its costs.

"This consolidation will make Pacific one of the stronger fully integrated Canadian oil companies and add significantly to its already substantial proven reserves of oil and gas," he added.

Motor fuels, distillates, burning oil, and asphalt from the company's refineries at Dawson Creek and Fort St. John will continue to be marketed in the Peace River area and along the Alaska highway under the Phillips 66 brand.

The consolidation was a natural development for all three companies because they already had experience working together on many joint ventures.

The Phillips refinery, gas-processing plant, and marketing facilities in the Peace River area were jointly owned with Pacific Petroleums, although operated by Phillips.

Pacific, Phillips, and Sunray also are participating jointly in developing a 148,000-acre concession in Venezuela on which production has been established.

Phillips and Sunray jointly held extensive reserves of oil and gas in Alberta and British Columbia. Pacific Petroleums at the start of 1960 held interest in 9,488,856 acres in Canada of which 3,421,474 was net, and in addition held a 300,000-acre concession in Alaska.

Pacific Petroleums also owns a 26% interest in Westcoast Transmission Co. Its crude production is 12,822 bbl. daily and gas production 104,000 M.c.f. daily. With approval of export permits to the U. S., the company's gas production should show a marked increase.

Anderson-Prichard Properties to Be Divided

ASSETS of Anderson-Prichard Oil Corp. of Oklahoma City will be split up among several buyers in a complicated financial deal which now awaits approval only of the firm's stockholders.

Under terms approved by directors, Anderson-Prichard will sell:

. . . Oil and gas producing properties to Union Texas Natural Gas Corp. and Frankfort Oil Division of Joseph E. Seagram & Sons Distillers for $97.1 million.

. . . Refining, marketing, and transportation facilities to a newly formed corporation, Apco Oil Corp., for $26.2 million. This company will be operated by present executives of Anderson-Prichard.

The financing . . . When the deal is closed, holders of Anderson-Prichard stock will receive about $50 per common share after giving effect to the conversion of all outstanding preferred to common and after expenses.

The financing of the deal is a complicated affair.

Of the $97.1 million to be paid for the producing properties, $80 million will be provided by a new firm, Brookston Oil Co., which arranged for $70 million from a syndicate of seven banks and three insurance companies and $10 million from another bank. Brookston in turn receives production payments from the oil and gas leases.

Balance of the financing was provided by Union Texas Natural and Frankfort. Union Texas Natural will acquire an undivided five-sixths interest in the properties and Frankfort a one-sixth interest.

As part of the transaction, Union Texas Natural will transfer to Anderson-Prichard certain of its own leases in exchange for Anderson-Prichard properties. Anderson-Prichard in turn will sell the leases to Frankfort.

Anderson-Prichard has 14,296 bbl. daily of crude production from 1,700 producing wells in 259 oil and gas fields in 10 states and Canada. It also has 950,000 acres leased with 77,000 acres productive.

Refining split . . . The new Apco Oil Corp., which is acquiring the refineries, marketing, and transportation facilities will be financed from two sources.

Apco has arranged for a $12 million loan from the First National City Bank of New York and plans to sell its securities to stockholders of Union Texas Natural and the public.

Apco will take with it all the Anderson-Prichard personnel now employed in refining, marketing, and transportation.

Anderson-Prichard owns a 25,000-bbl. refinery at Arkansas City, Kans., and a 12,500-bbl. plant at Cyril, Okla.

Underwater-Storage Ideas Ready for Testing

BETHLEHEM unit will hold 20,000 bbl. of crude produced by Eugene Island wells. Platform will hold production equipment, crew quarters.

HIGGINS unit will store more than 15,000 bbl. of crude for ODECO, will go into operation probably by the end of September.

- Navy already is checking rubber-bag storage. Now two ocean-floor "tanks" are going to work for oil firms.

THE LOUISIANA offshore industry is giving the theory of underwater storage a thorough and practical test.

Three such tests either are under way or preparing to start. Two are for crude and one for product. The three:

. . . **Bethlehem Steel Co.'s** new 20,000-bbl. unit, now under tow to a California Co. location in Block 110, Eugene Island area.

. . . **Higgins Co.'s** 15,000-plus-bbl. unit, ready for launching and later to be towed to an offshore location of Ocean Drilling & Exploration Co.

. . . **U. S. Rubber Co.'s** 50,000-gal. rubber container, now in use by the Navy for refueling ships.

If the three perform as expected, many more undoubtedly will be built.

Bethlehem's . . . The Bethlehem unit consists of a compartmented tank 112 ft. long, 92 ft. wide, and 10 ft. thick.

Operators will dredge a 10-ft.-deep area, into which the tank will be lowered. The top of the tank will then fit flush with the ocean floor.

Above each corner of the tank rises a tube 18 ft. in diameter toward the bottom and 5 ft. at the top (photo). The tubes give stability, provide more storage capacity, and support four surface platforms.

These platforms provide living quarters for 10 men, a heliport, and space for production equipment.

The unit will be sunk in 35 ft. of water by letting sea water into the tank. This ballast will be displaced by crude from nearby wells, flowing in from the top of the columns. By reversing the process and pumping sea water into the bottom of the tank, the operator can discharge oil at a rate of more than 2,000 bbl. an hour.

Bethlehem's unit was designed for easy moves. In a test at the Beaumont shipyard, it was submerged and raised easily within 12 hours. Calco plans to keep the unit on location indefinitely but may raise it periodically for inspection.

Higgins' . . . The Higgins submersible storage unit was designed by ODECO, its owner, and will use permanent ballasting to keep it on the ocean bottom.

Crude will be stored in large cylindrical tanks with an over-all length of 209 ft. and width of 88 ft. (OGJ, May 23, p. 68).

Three platforms for living quarters, heliport, and equipment are located 45 ft. above the tubular sections and 15 ft. above the surface of the water.

Refloating is accomplished by emptying the permanent ballast tanks.

The unit was scheduled for launching last week end and will be moved onto location for ODECO in about a month.

U. S. Rubber . . . For more than 2 months the U. S. Navy has been testing a rubber bag submerged off Louisiana and filled with diesel fuel.

Fares Hanna, Houston engineer and designer of the bag, believes it would be useful also for crude storage offshore. This, however, would involve tying together a large number of the bags. The one in use holds only 1,200 bbl.

The bag is 68 ft. long, 17 ft. wide, and 6 ft. thick when full and is harnessed to a metal frame which is anchored to the ocean bottom.

Regular Up Again

. . . in octane rating, while premium dawdles at 99.3.

THE OCTANE number of regular gasoline continued its upward march last month while premium declined slightly.

Gasoline on sale at service stations in August had national weighted average of 92.6 research octane number, 0.1 above July and 0.5 above a year ago, according to the Ethyl Corp. survey of antiknock quality.

Premium averaged 99.3 RON, 0.1 below July but 0.1 above a year ago, according to tests of 1,000 gasoline samples purchased at stations in 57 U. S. marketing centers.

Expressed as motor octane numbers, regular was 84.6, 0.3 above July and also 0.3 above a year ago; premium was 98.8 in August, 0.1 above July and 0.7 above a year ago.

The survey underlined the increasing importance of regular gasoline, which at higher octane numbers is satisfying a growing percentage of automobiles and accounting for a rising share of total sales.

Regular ranged from 88.8 RON at Denver, the only reporting city below 90, to 94.3 in Buffalo, N. Y., last month, while premium ranged from 96.3 RON at Denver to 99.8 at Corpus Christi, Tex. Twenty-one cities reported increases over July in premium, 26 reported decreases, and 10 were unchanged. In regular gasoline, 29 cities reported increases over July, 12 reported decreases, and 16 were unchanged.

watching WASHINGTON

Clyde La Motte

• In prospect: An FPC blueprint for regulation . . .

THE COMING decision by the Federal Power Commission in the Phillips case may very likely be the most far-reaching of any the commission has handed down since that fateful day when the U. S. Supreme Court ruled that the FPC must regulate interstate sales of natural gas right back to the wellhead.

The Phillips case has been considered a key one all along, of course. And now there are indications that the FPC may use it as a vehicle for outlining its basic regulatory philosophy and approach.

That is, the Phillips case decision—which the commission hopes to make public this month—may include a broad policy statement aimed at making clear the direction the FPC is heading, and why.

The commission has been criticized for its failure to state such a guiding policy. As a result, a company appearing before it had to shoot in the dark, with few guidelines. The commission staff was in much the same boat, too.

The net result was a lot of wasted motion and confusion in the case-by-case, point-by-point procedure.

In the blueprint it hopes to provide in the Phillips decision, the FPC will draw not only upon the Phillips case hearings and studies but upon findings in other cases, prior rulings, and court decisions.

• Area pricing system has its drawbacks, but . . .

ONE OF THE major steps the commission is likely to take in the Phillips case is to outline a plan for area pricing.

The commission is acutely aware that this approach has its dangers and its problems. But apparently the experts haven't found a better approach.

In developing area pricing, it is expected that the commission will make a study of one or more of the larger producers in a given area in arriving at an area ceiling.

After that, if you, as a producer, want to sell to an interstate pipeline, you may expect to get the area price. If you seek a higher price, you'd have to be prepared to convince the FPC that such a price was justified in the public interest.

For the individual producer, the area pricing approach could prove to be good or bad, depending on his particular situation. If his selling price was below the area price, he would gain because the price would be easier to increase. If, however, his price were above that of the area, it would probably get trimmed back.

Furthermore, some areas—particularly the older ones—may get caught with price ceilings considerably below newer areas. However, with the general increase in natural-gas prices of recent years, this is not nearly as common a situation as in the past. That is, prices in general have tended to become more uniform.

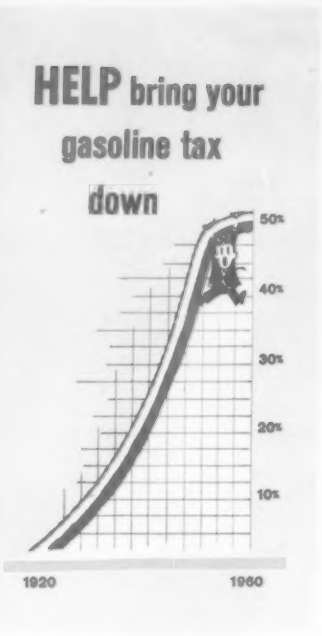
• Cost will have a lesser role in rate-making . . .

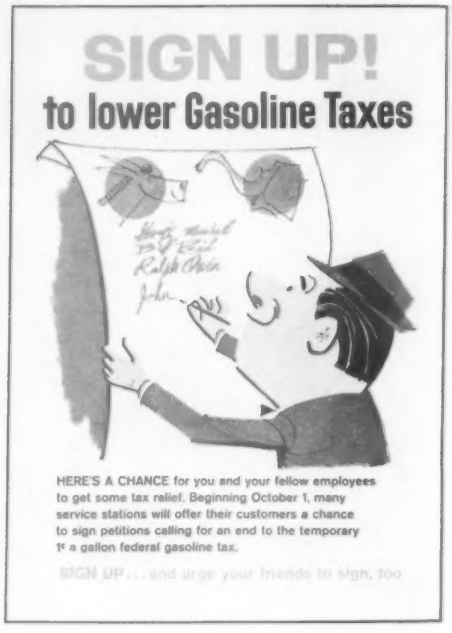
COSTS ARE likely to play a less important role in future FPC rate-making than the industry has feared.

The FPC will certainly continue to consider costs—it is required to do so by a Supreme Court ruling—but it will tend to put more emphasis on other factors.

Ironically, one reason for the de-emphasis of costs is that in many cases higher rates would result if costs were made the controlling factor.

There is the feeling by some at the commission that the courts have stressed costs with the idea of protecting the eventual gas consumer. When the courts realize, as the commission is beginning to do, that rate-making based primarily on costs might increase consumer prices in many cases, they may be less eager to insist on the cost factor in determining prices.




SIGN UP!
to lower Gasoline Taxes
HERE'S A CHANCE for you and your fellow employees to get some tax relief. Beginning October 1, many service stations will offer their customers a chance to sign petitions calling for an end to the temporary 1¢ a gallon federal gasoline tax.
SIGN UP . . . and urge your friends to sign, too

U. S. to Watch Resid Prices

. . . and may ask oil companies to send in periodic price reports. It could be a first step toward price control.

THE OFFICE of Civil and Defense Mobilization is pushing ahead with a study to determine the feasibility of requiring periodic price reports on residual fuel oil.

This would be the Government's first postwar step toward oil price controls, even though adoption of a proposed price reporting form would not necessarily mean the Government would intervene in actual pricing.

Although no final decision has been made, OCDM has drafted a report form which it has discussed with some oil industry officials.

The Bureau of the Budget, which must approve all such forms, has been called into the discussion.

OCDM apparently plans to put the reporting procedure into use as soon as possible, although there have been some indications that it has run into problems which may cause delay.

The purpose of gathering the price data is to determine at just what price residual fuel oil is selling.

OCDM officials say price discounting is such a widespread practice, posted resid prices seem to have little meaning.

The coverage planned . . . At this point in the planning, it is OCDM's intention to require such reports from residual fuel oil importers, particularly those in the East Coast area, and from major residual fuel distributors.

It is understood that consideration has been given to requiring a company to break down its sales by consumer groups, such as industrial, commercial, etc., and give its total revenue from such sales. In this way, OCDM could obtain the average price in the various categories.

However, the report may not be that specific. Instead, it may only require total residual sales during a given period and the total revenue from these sales.

No decision has been made as to the frequency of the reports, but they will likely be monthly or quarterly.

Companies willing? . . . An OCDM official, asked the industry's reaction to the proposed reporting procedure, said most firms contacted had indicated a willingness to do it.

"Of course, no company official is eager to get his firm saddled with new government forms to fill out," he said.

There were other indications, however, that at least at the distributor level considerable opposition is developing to the idea of providing the Government with detailed pricing information.

For one thing, some of the information requested in the tentative draft of the reporting form would require considerable time and expense for a company to obtain and submit.

Too, some residual sellers simply don't feel the Government should be asking for individual pricing moves by a firm in such a competitive field.

How it started . . . OCDM got into the price picture after a delegation of New England industrialists had gone to Washington to protest a 15-cents-a-barrel increase in residual fuel prices (OGJ, Aug. 29, p. 49).

OCDM had been given the duty of price surveillance by President Eisenhower when he issued the original proclamation setting up import controls.

OCDM had no occasion to exercise this authority, however, until the New England group made an issue of the residual fuel price hike.

Confronted with the problem, OCDM officials concluded that in order to make any decisions on whether any price increases were justified, they would have to develop some system of gathering and evaluating price data.

That is when OCDM began consideration of a reporting form for residual fuel prices.

OCDM has no intention at this time of broadening the price-reporting requirements to include prices of imported crude or products.

It's All-Out War on the Temporary Tax

TEMPORARY gasoline taxes have an odd habit of becoming permanent.

But the 1-cent extra federal tax which went into effect last October is going to have a tough fight to stay alive after its scheduled expiration date of next June 30.

Beginning October 1 the oil industry is going to conduct a petition-signing campaign which it hopes will swamp senators and representatives from all 50 states.

The campaign will be directed by the Gasoline Tax Education Committee, a special group of the American Petroleum Institute. It will use radio, television, newspapers and billboards to tell motorists, "You're in the 50% tax bracket!"—that's the percentage of the tax in the price of gasoline. And it will urge them at service stations to sign petitions asking Congress to see to it that this temporary tax is allowed to expire on schedule.

Petitions signed in each state will be handed personally to Congressmen in that state.

But the program won't end here. A relentless educational campaign will continue through most of the 9 months between October 1 and June 30. Particular emphasis will be given next March and April when motorists are tax conscious.

The committee will argue that the temporary tax will not be needed to keep the federal highway program going. When the 1-cent increase was voted, a substitute for the revenue was built into the plan. Part of the more than $1.5 billion in automotive taxes now being spent for nonhighway purposes is scheduled to go into the highway fund.

Map "Proves" Offshore Claim

. . . of 3 leagues, say attorneys for three states. Their hope: Supreme Court will grant petition for rehearing.

A 116-YEAR-OLD map has been submitted to the U. S. Supreme Court as new evidence supporting the claim of Louisiana, Mississippi, and Alabama for a seaward boundary equaling the 3 leagues the court granted Texas and Florida.

Photostatic copies of the map, discovered after a 4-year search in the National Archives in Washington, are attached to a supplement to petitions for rehearing filed by the attorneys general of the three states.

The map was originally prepared by the General Land Office and was submitted to the second session of Congress in 1844 as Senate Document No. 7. Its purpose was to outline boundaries set by treaties.

The supplementary brief links the lines marking treaties of 1803 with France and 1819 with Spain to a finding by the U. S. Supreme Court that Spain had claimed a territorial limit of 3 leagues.

The line purporting to designate the boundary set by the 1819 treaty extends beyond the mouth of the Sabine River and along the Gulf Coast, around Florida, and up the Atlantic seaboard.

Although there is no designation of the distance of the line from the shore, and no scale, the attorneys presenting the petition say the line "unmistakably" extends 3 leagues, "which the court has found to exist as concerns the states of Texas and Florida."

The map was discovered in the National Archives by George Arceneaux, an aide to Louisiana Sen. Allen J. Ellender.

"Now that we have the map I don't believe the Supreme Court can, or will, ignore this new and conclusive evidence," Louisiana Attorney General Jack Gremillion said.

The Supreme Court is expected to rule this fall on the petition for a rehearing of its original decision made in June.

Arizona test dry

HUMBLE Oil & Refining Co.'s attempt to extend production in northeastern Arizona has failed.

An outpost well, 6,500 ft. northwest of Arizona's first commercial oil producer, was plugged and abandoned after going to 6,260 ft.

The well was the East Boundary Butte 2 Navajo. Located northwest of the 1 Navajo, it was just 1,650 ft. south of the Utah border.

The 1 Navajo discovery was completed in 1955 but is shut in because of its high gas-oil ratio. The 1-E Navajo, to the southeast, also is a shut-in oil producer with a high gas-oil ratio.

California May Put Offshore Leases Up For Sale This Year

CALIFORNIA is expected to hold its first offshore lease sale since mid-1958 in December.

Alan Cranson, chairman of the State Lands Commission, says the commission has not yet set a date but is considering December. About 50,000 acres off Santa Barbara County is being eyed for the sale. However, it is doubtful the state will lease the whole package. The acreage probably will be spread over two or three sales.

Most of the acreage is between five offshore tracts leased in June 1958. The five tracts, covering 19,200 acres, brought bonus bids totaling $55,500,000 (OGJ, July 7, 1958, p. 72).

Before any sale is held, two important decisions must be made by the commission:

. . . What leasing procedure will be used? The state may repeat the bonus-bidding pattern and retain a sliding-scale royalty or it may decide to lease the blocks strictly on a royalty basis.

. . . How much acreage to offer? Shell Oil Co. has nominated most of the area under consideration, but this doesn't mean the state will follow Shell's nomination.

There is a chance the lands commission will resolve both these questions in September or October.

Anyone who wanted to protest the proposed lease sale had a chance to appear before the commission in Santa Barbara late in August, but no serious complaints were voiced.

There were some questions raised about drilling within a mile of the coast, but the commission assured the Santa Barbara residents no drilling within a mile of shore will be permitted east of Gaviota, near the county's beach and recreational development.

Two of the five blocks leased in 1958 have been tested, but no commercial oil has been found. Drilling on two other tracts is planned this fall, but the acreage has not proved as attractive as it looked originally.

However, the state is also considering leasing this year a 2,560-acre tract south of Ventura in the Montalvo area which may prove to be better acreage than the areas off Santa Barbara. The Montalvo acreage is near proven production.

Gas Boom Is Oil's Bane, Winger Says

• Expanded natural gas use has been a depressing factor in the oil industry, Chase Manhattan Bank economist contends. And oil has fed and fostered this competition by not allocating proper costs to natural gas.

JOHN G. WINGER, vice president of the petroleum department of the Chase Manhattan Bank of New York, sounded like a prosecuting attorney in an appearance last week at the American Bar Association's annual meeting in Washington, D. C.

Winger was one of a panel of speakers at a sectional meeting on mineral and natural resources law.

The "case" he built was against natural gas.

He indicted natural gas as the culprit contributing heavily to many of the oil industry's problems.

He thinks natural gas has helped shape market conditions which have brought about extremely low allowables in oil-producing states.

It has driven more oil producers to seek outside capital, only to find that banks and other lenders are growing more reluctant to make loans under current conditions.

Because it has cut deeply into markets for middle-of-the-barrel oil products, it has forced refiners to concentrate more and more on gasoline—even though gasoline use comprises only about 20% of the nation's energy market.

It has been rough on oil jobbers and marketers because natural gas has grabbed much of the home-heating market.

And, perhaps worst of all, it has tended to slow exploration and drilling, thereby slowing the development of both oil and gas reserves.

Oil helps gas . . . The irony of it all, from Winger's viewpoint, is that the oil industry "subsidizes" this troublesome competitor.

The industry has done so by failing to allocate a fair share of costs to natural gas.

Winger explained to the lawyers that this came about originally because the industry considered natural gas merely as a by-product. And the imposition of Federal controls on gas producers' prices has helped further this unbalance of costs.

One thing in particular that alarms Winger is the fact that very little of the gas consumer's dollar ever gets back to the producer. To the oil economist, this means the producer has less capital for exploration.

John G. Winger
. . . gas cuts oil's markets.

Here is how Winger presented the picture to the group in Washington:

In the East Coast area—where 50% of the home-heating oil is consumed at present—the seasonal heating-oil cost to a home owner is about $200.

Of this $200, about $102 goes back to the producer to pay for the crude oil used. The remainder goes for refining, transportation, and marketing.

But the situation is entirely different with natural gas. If the East Coast home owner uses gas, his annual heating bill will be about $282 (based on current gas prices in the East).

Of that $282, the producer gets only $22. The remaining $260 goes chiefly for transportation and distribution.

Exploration suffers . . . Winger is not accusing the gas pipeline companies or the public utilities of getting unduly rich off of this. He realizes that pipepine construction and local distribution facilities are costly.

His point, however, is that it is only the portion of the total revenue the producer retains that goes for exploration for more reserves. The portion the other segments retain does not go for that purpose.

So, every time an East Coast home owner decides to use gas instead of oil, there is only $22 instead of $102 going back to the oil patch to be used for more oil and gas exploration.

Winger also cites this impact on the producer:

At the end of World War II, the average refinery yield of gasoline from crude oil was 43%. But last year, the average was 51%.

Suppose refiners had maintained the 43% average last year in filling the gasoline demand. Had they done so, it would have required an additional 1.5 million bbl. daily of crude to have enabled them to supply the required volume of gasoline.

That would have meant an increased production of 1.5 million bbl. daily.

And if refiners should move to a 55% gasoline average, it will mean a further reduction of 1 million bbl. daily of crude.

The refiners produce a higher per cent of gasoline, of course, because they do not have a profitable market for products lower in the barrel. And they do not have these markets, Winger reasons, because natural gas has taken many of them away.

According to Winger's line of reasoning, a 25% reduction in sales of natural gas would have permitted refiners to maintain the old 43% rate—and there would be higher allowables in Texas today.

Expanding gas influence . . . Look-

PIPELINE

Interstate natural-gas pipeline companies took in $253,624,679 in June of this year compared to $220,688,161 in the same month of last year. It was an increase of 14.9%. Gas sales to other utilities were 545.7 billion cubic feet in June, a 4.4% increase over June of 1959. Sales to ultimate consumers were 142.2 billion cubic feet, a decrease of 1.4% from June 1959.

Little Big Inch division of Texas Eastern Transmission Corp. plans to reopen terminal facilities at Norris City, Ill. Norris City was the eastern terminus of the first stage of the Big Inch line in World War II. Up to 1,250 tank cars per day were loaded here for shipment to the eastern seaboard. The new terminal will serve

ing to the future, Winger expects that natural gas will continue to play an even more dominant role in the price of crude oil.

What this means, to Winger, is that you cannot expect an increase in crude prices in the years ahead—even though the lid is kept on imports.

Gas prices, of course, will continue to rise—and should rise. Even so, Winger says, the total average price for oil and gas is facing a continuing downward trend, so the producer can get little satisfaction from seeing gas prices rise, if his over-all revenue is declining while his costs are continuing to climb.

The crux of the problem, Winger concludes, is the matter of cost allocation between oil and natural gas.

"Gas is a big boy and should stand on its own feet for the good of all segments of the industry—and the good of the consumer, too," Winger told his Washington audience.

"Gas should share its part of costs. It is unreasonable that crude should continue to bear the burden."

Crude Market Gets Better

...as higher prices are set in four areas. Some crude in the Illinois Basin now draws a premium price.

NEW evidence that the domestic crude market is extremely tight came last week when more buyers posted higher price for oil in Illinois basin, Kentucky, Michigan, and Ohio.

Most of the oil companies posted 15-cent increases; but Ashland Oil & Refining Co., a major buyer in the region, put up a 20-cent increase for the Illinois basin and eastern Kentucky. This is 5 cents more than the price cut Ashland made last June.

Ashland's new base prices are $3.05 per barrel in Illinois basin and $2.92 in eastern Kentucky. Ashland also advanced Green County, Kentucky, prices 5 cents per barrel to $2.65 and Corning (Ohio) crude 5 cents to $2.77.

Ashland's action actually places about one-fourth of the Illinois basin crude under a 5-cent premium price. Basin production including Green County is running about 325,000 bbl. daily while Ashland's purchases total about 70,000 bbl. daily.

Meanwhile, several other firms advanced Illinois basin crude 15 cents to a $3 top. Included in this group were the Indiana Farm Bureau, Sohio Petroleum Co., and Rock Island Refining Corp. Ohio Oil Co. started the series of price changes the week before with a 15-cent boost both in Illinois basin and Michigan. The increase in Michigan to a $2.95 top now has been joined by Bay Refining, Leonard Refining, and Osceola Pipeline.

Ashland view . . . Ashland President Everett F. Wells in announcing the new prices said they give "expression to our strong conviction that crude-oil prices should be sensitive to refined products prices which, in our opinion, directly reflect any excess or shortage of crude oil supply available to refiners."

He added: "Thanks to the realistic action of the Texas Railroad Commission in continuing to curtail the supply of Texas crude oil, refinery runs are now beginning to decline, which gives support to the recent advances in prices of refined products.

"The refineries of our company are now realizing an average of approximately 20 cents per barrel more for the products from a barrel of crude oil than when we made the reduction in June of 15 cents per barrel in the price of Illinois basin crude oil. It now appears that the higher prices for products will hold at least so long as crude production is kept under control.

"The reduced supply of crude oil, combined with our reduction in the posted market, created a sudden demand for our excess inventories of Illinois oil for which previously we had been unable to find buyers at 10 cents below our posted market. There now is a healthy demand in our area both for crude oil and for refined products.

"The differential between the prices of crude oil and refined products continues, however, to be too small to provide much satisfaction for refiners but it is one we can live with. If products prices do not hold, it will be because there is still too much crude oil, either domestic or imported, available to refiners.

"In that case crude-oil prices should be reduced until production is brought into balance with refined products requirements."

BRIEFS . . .

southeast Illinois, southwest Indiana, and northwest Kentucky.

Proposals by El Paso Natural and Colorado Interstate gas companies to build transmission facilities between Rock Springs, Wyo., and the California-Nevada border will be the subject of oral argument before the FPC September 27. The companies' proposal to bring an additional 470 million cubic feet of natural gas to southern California markets is expected to be opposed by several interests.

Southern Natural Gas Co. has acquired the assets of Timcoat Corp. and will operate it as a separate company. The Timcoat plant on the Algiers canal near Belle Chasse, La., will continue pipe-coating operations. Timcoat has been in business about 5 years and is the exclusive producer of a high-density flexible coating of rubberized asphalt mastic reinforced with glass fiber.

Tennessee Gas Transmission Corp. has let the contract for construction of 24 miles of 30-in. line in Erie and Wyoming counties, New York, to J. P. Neill & Co., Inc. Work is scheduled to get under way immediately.

Work has begun on the construction of 60 miles of 30-in. line between Hope, Ark., and Bloomburg, Tex., for Peoples Gulf Coast Natural Gas Pipe Line Co. Sharman, Allen, Gay & Taylor is the contractor.

Also for Pipeliners . . .

IN THE NEWS: New gas line in northern British Columbia opens one of world's greatest reserves to market (p. 99) . . . Argentine petrochemical complex proposed by five American firms involves a 900-mile liquids pipeline (p. 108) . . . Loading line completed to open Tierra del Fuego crude to market (p. 108).

PLUS THESE TECHNICAL REPORTS: Trunkline will use turbine centrifugals for field boosting (p. 181) . . . Safety in hot tapping pipelines and storage tanks (p. 183).

Change in East Texas Asked

. . . so that operators can get the extra oil they earn by reinjecting salt water. The problem: They can't now produce this extra oil because of the 8-day schedule.

THIS SUMMER'S skimpy — and prolonged—8-day Texas allowable is upsetting a time-honored system in East Texas field.

This is the arrangement by which producers earn a bonus allowable by reinjecting produced salt water.

The bonus is still granted. And it can be transferred to other wells. The only trouble now is that, while producers continue to inject large volumes of salt water, they are unable to produce the extra oil they earn. There just aren't enough prorated wells in the fields to produce, on an 8-day schedule, the bonus oil.

The Texas Railroad Commission is now mulling over a request of East Texas Salt Water Disposal Co. to amend the salt-water-allowable-transfer rule to increase the amount of bonus allowable a single well can accept.

How the bonus works . . . The salt-water bonus allowable dates back to the late 1930's.

The commission adopted this rule as a means of encouraging producers to reinject salt water. The water was being produced with Woodbine oil in such volume that it otherwise threatened to pollute every stream in East Texas and even Gulf Coast rice fields.

Water injection had been proved feasible. And it would also serve to maintain reservoir pressure.

The rule grants bonus allowable on a flexible scale depending on volume of water reinjected. Currently, it is granted on the basis of 1 bbl. of allowable for roughly each 126 bbl. of water reinjected.

The bonus allowable may be transferred to another well on the same lease. Or it may be sold to another company if the original operator does not have eligible wells to handle the added allowable.

The hitch is that the rule also provides that no prorated well can accept more than 6 bbl. a day of transferred bonus oil.

The commission interprets this rule as meaning 6 bbl. per producing day. Thus on 8 days, no prorated well can accept more than 48 bbl. a month.

Suppose that an operator has a two-well lease, one well making water and the other water-free. If the first averages 126 bbl. of water daily, the operator gets a bonus of 1 bbl. of oil per day or 30 bbl. for a 30-day month which he may transfer to his other well. All well and good.

If the water-producer, however, should make an average of 252 bbl. of water daily, the bonus allowable for the month earned by reinjecting this water would be 60 bbl. daily. With the current 48-bbl. limit on bonus transfers, the operator would have 12 bbl. of bonus oil which he could not transfer to his second well. Thus, he would have to sell this allowable to some other operator.

The problem is that there are not enough proratable wells in the field to handle all such bonus oil. No well producing more than 25% water is eligible to receive bonus transfer.

Problem growing . . . W. S. Morris, vice president and general manager of East Texas Salt Water Disposal Co., has informed the commission that 203 independent producers in the field depend on other companies to produce their bonus oil.

Three of the 12 companies which have been producing the bonus oil for the smaller firms have run out of proratable wells eligible to handle it.

During August, total earned salt-water allowable transferred came to 87,782.96 bbl.—or 10,972.87 bbl. per producing day. To produce this volume of bonus oil, with the 6-bbl. per producing day limit, now requires 1,829 prorated wells.

What to do . . . Morris asked that the commission change the rule to permit bonus transfers of up to 10 or 12 bbl. daily, or to change its interpretation of the rule from 6 bbl. per producing day to 6 bbl. per calendar day.

A 10-bbl. per producing day limit would cut the number of required proratable wells to 1,098, he said. Twelve barrels would reduce the number to 915 wells. The switch from producing to calendar days would mean only 472 wells would be needed.

Shell Oil Co., Sun Oil Co., and Tidewater Oil Co. back the changes suggested by East Texas Salt Water Disposal. Atlantic Refining Co. favors a 20-bbl. limit if on producing-day basis, otherwise that the limit should be 6 bbl. per calendar day.

PROCESSING

A second methyl gasoline is being sold on the West Coast. Powerine Oil Co., an independent, is the new marketer of a gasoline with tetramethyl additive. Standard of California introduced methyl gasoline about 4 months ago. Ethyl Corp. is supplying both companies with methyl.

An extreme pressure additive for use in automotive trans-axle fluids, gear oils, and industrial cutting oils has been developed by Ethyl Corp. It consists of a mixture of chlorinated phosphorous compounds and is available in development quantities at $2 a pound.

A gas-liquids plant with an initial processing capacity of 150,000 M.c.f. daily is planned for the Port Acres and Port Arthur, Tex., fields. Operators negotiating final agreements for the $4 million plant are Michel T.

Line Will Tap Prolific Gas Area

- 245-mile, 30-in. line will provide outlet for reserves estimated at 2.5 trillion cubic feet in northern Canada.

ONE OF the world's great natural-gas reserves will be tapped late next year.

Construction is scheduled to start this month on a 30-in. transmission line connecting the Fort Nelson area with the Fort St. John, B. C., terminus of Westcoast Transmission Co.'s line to Vancouver.

The new line will be built by Gas Trunk Line of British Columbia Ltd. It will provide an outlet for Petitot River, Kotcho Lake, and Clarke Lake fields, north and east of Fort Nelson. Reserves of this area are estimated at 2.5 trillion cubic feet.

Costly line . . . Construction work is scheduled to start this month and is due for completion in December 1961. Cost of the 245-mile system will be $93,000,000. This is an average of close to $400,000 per mile, making it an exceptionally costly project.

The new system will tie in with the Westcoast Transmission system, which carries gas from the Fort St. John area to the Canadian-U. S. border. It serves southern British Columbia markets en route. At the border it supplies the El Paso Natural Gas system.

First step in the Gas Trunk Line program will be gathering lines to presently untapped areas at the south end of the route. One of 55 miles will serve Nig Creek, Laprise, and East Laprise fields northwest of Fort St. John. Another, 30 miles, will serve Boundary Lake field, northeast of Fort St. John, and also provide an outlet for the Floral and Worsley fields in Alberta.

Construction of the southern gathering lines is expected to be completed this winter. Building of the main 30-in. line will start in the spring. It will parallel the Alaska highway and will cross Peace River. The Lily, Klua Creek and Pocketknife fields, lying along the highway, will also supply gas to the line.

Initial capacity of the transmission line will be 350 million cubic feet per day. It will be possible to increase this to 650 million cubic feet with the addition of compressor capacity.

Westcoast to expand . . . New source will necessitate an increase in the capacity of the Westcoast line to the U. S.

It is now carrying some 300 million cubic feet per day. Immediate plans call for the addition of two compressor stations at a cost of $25,000,000 which will increase Westcoast's capacity to 660 million cubic feet per day.

Pacific Petroleums Ltd., one of the originators of the Westcoast system, is the primary sponsor of the Trunk Line system, which will be owned by producing companies in the Fort Nelson area.

BRIEFS . . .

Halbouty, Meredith & Co., Kilroy Co. of Texas, Pan American Petroleum Co., and Peter Henderson Oil Co. Hudson Engineering will build the plant. Completion is scheduled for the spring of 1961.

The Calgary gas plant, which will process gas from the East Calgary producing area, will be constructed by Ralph M. Parsons Co. of Canada. Estimated cost of the plant is $9,240,000. When operating at designed capacity it will produce 100,000 M.c.f. daily of pipeline specification gas, 860 tons of sulfur, and 90,000 gal. of liquid products. Preliminary construction may be possible this fall.

An acetylene plant is to be constructed by Diamond Alkali Co. at its Deer Park plant near Houston. Diamond will use the production of 40 to 60 tons a day to make vinyl chloride monomer. Linde Division of Union Carbide will build and operate an oxygen plant adjacent to the acetylene plant to supply it with oxygen. Completion will be in November 1961.

A crude distillation unit with a capacity of 37,000 bbl. daily will be constructed at the Standard Oil Co. (Ind.) refinery west of Casper, Wyo. The unit is expected to be completed by September 1961. It will permit the retirement of obsolete facilities, including crude stills, a thermal cracking unit, coke stills, and some tankage.

Construction of new liquid-recovery facilities at Shell Oil's Provident City, Tex., gas plant is expected to begin in October. Additions will raise the plant's production of propane from 21,000 gal. daily to 33,000 gal. Natural-gasoline production will be increased 5,000 gal. daily to 55,000 gal. Contractor is Gasoline Plant Construction Corp. of Houston.

Also for Refiners . . .

IN THE NEWS: Super highways pose a problem for marketers barred from the rights-of-way (p. 89) . . . New Apco Oil Co. formed to take over refining and marketing facilities of Anderson-Prichard, which is being split up (p. 91) . . . Octane number of regular gasoline rises again, premium is down (p. 93) . . . OCDM moves to keep an eye on residual prices (p. 94) . . . Other buyers posting price increases for Illinois basin, Kentucky, Michigan, and Ohio crude (p. 97) . . . Pauley again enters the retail marketing field in California (p. 106).

PLUS THIS TECHNICAL REPORT: Annual petrochemical report shows big surge in building (p. 112).

Four New Drilling Tools Bow in With

FOUR NEW tools to aid oil-well drilling were unveiled last week by Jersey Production Research Co. before oil men, tool makers, service-company men and others. The Jersey scientists demonstrated:

. . . A wall-anchored drill collar, designed to take the place of conventional drill collars in placing desired weight on the bit.

. . . A downhole recorder to study bit action under actual drilling conditions.

. . . A fluid-entry analyzer to locate points of entry of fluid into the well, and to identify the fluid.

. . . A pressure chamber to determine how rock breaks up on impact under simulated bottom-hole conditions.

Occasion for the demonstrations was the completion of a new laboratory building devoted exclusively to drilling research. The building covers 13,000 sq. ft. of floor space and is specially designed to accommodate heavy mechanical-engineering research work.

Aim: cost cutting . . . "This new facility at Jersey Production's research center is unsurpassed in the field of drilling research and features the most modern equipment available for our continuing efforts to improve drilling equipment and procedures," R. C. Curtis, president, told the oil press at an earlier showing.

"Our increased emphasis in this field reflects the oil industry's concern regarding steadily mounting drilling costs," he added.

The laboratory maintains close working relationships with Jersey producing affiliates, so that new developments can move into the field immediately, Curtis said.

Research paid for . . . Tailored drilling practices, the combination of research with the best of proved field practices, and adapted to specific well needs, more than pay the total cost of drilling research, said T. O. Allen, manager of the drilling and development division.

Since the first of this year, research engineers have made 19 trips to affiliate operations outside the United States to assist affiliate personnel in applying tailored technology and give on-the-spot cost-cutting assistance, he said.

Applying tailored drilling practices in one field in the Williston basin has reduced drilling time 40%, said Alan P. Roberts, drilling-research section head. Prior to 1959, drilling cost in this field was $73,000 per well. Now similar wells are drilled for $47,000.

In Venezuela, drilling time was reduced 43% in one deep area. In one Canadian field in northern Alberta, drilling time has been reduced 20%.

1. Wall-anchored drill collar

THE NEW hydraulic wall-anchored drill collar can be used to apply high bit "weight" without the use of conventional drill collars, said R. J. Howe, drilling research section head.

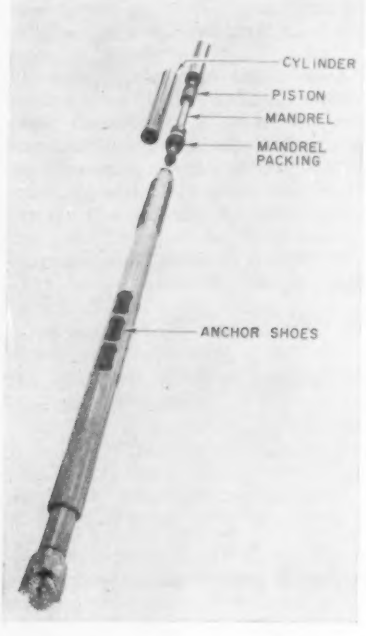
The new tool, which weighs only 2,200 lb., or about 5% as much as conventional collars, can apply the same weights hydraulically, using normal mud pressure as supplied to the bit.

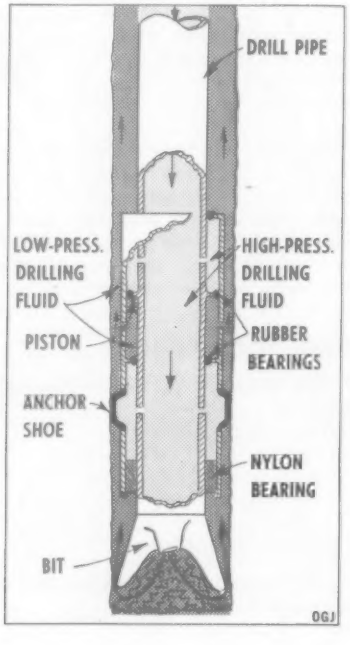
First use of the hydraulic unit will be in areas where high weights are required at shallow depths which limit the length of drill collars. However, field tests indicate that it may soon be used for deeper drilling too, he said.

A small 2,500-ft. rig has drilled 2,000 ft. of hole at the Jersey laboratories using the wall-anchored collar. When tested on a rig near Midland, Tex., the tool drilled 500 ft. in 45 rotating hours.

The prototype tool is 6 in. in diameter and 37 ft. long. It can exert a force of 40,000 lb. at a pressure drop of 1,000 psi. across the bit. The tool is sized for a 6¾-in. hole, but will work if the hole is up to 7¾ in. No trouble is expected from washouts in sloughing formations because these ordinarily occur 50 to 100 ft. above the bit, Howe said.

It is necessary to reset the present tool after drilling 2 ft.; however, development is well along on a tool which will reset automatically. Resetting takes about 45 seconds, he said.





What it's like . . . The new tool consists of several pistons rotating inside a steel case anchored to the wall of the hole by special diaphragm-type anchor shoes (see diagrams).

The anchor shoes are expanded against the wall of the hole by pressure drop across the bit. The pistons, which are staged in series, utilize the pressure drop across a conventional jet bit to apply the necessary hydraulic loading of the bit.

The top of each piston is exposed to the high-pressure drilling fluid inside the drill pipe, while the underside of each piston is vented to the lower-pressure fluid in the space between the drill pipe and the wall of the hole.

Completion of Jersey Research Lab

2. Down-hole recorder

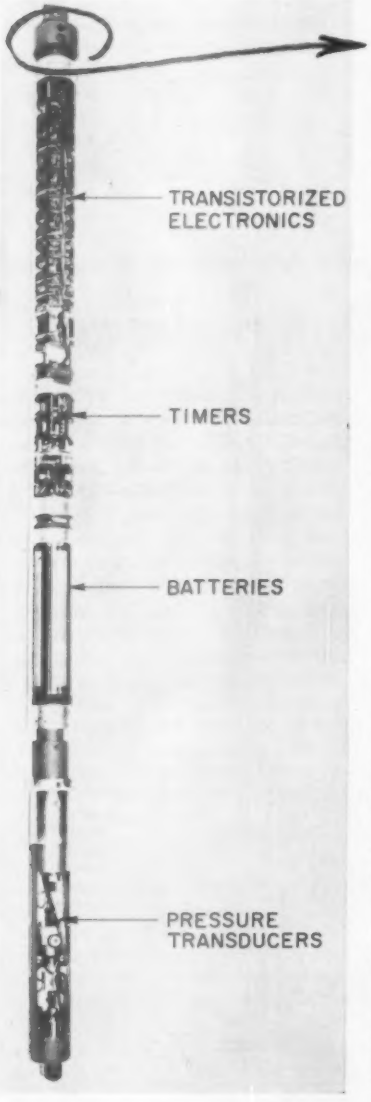
JERSEY Production's new down-hole recorder is a special research tool to obtain a better understanding of the conditions under which drill bits operate deep in the earth, Howe said.

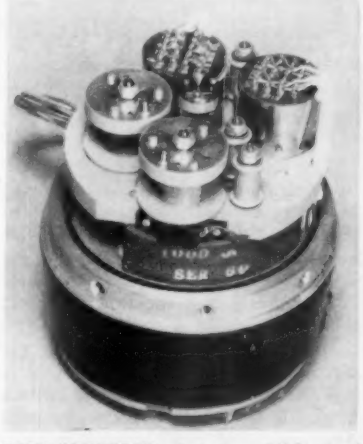
Such information is urgently needed by bit designers so that they can develop improved drilling tools. During the 60-year history of rotary drilling, this information has been gained largely by deduction—it has not been possible to obtain reliable downhole measurements to establish actual drill-bit environments.

This new recording instrument should lead to a number of improvements, not only in drill bits but in the manner in which they are used. Thus, it promises to be one of the most significant drilling-research tools ever devised because reliable bottom-hole engineering data will lead to a better understanding of the fundamental processes involved, Howe said.

It is expected that information obtained from the recorder will permit a significant reduction in the number of bits required to drill a given well. And perhaps it may be possible ultimately to drill a well using only one bit. This would cut drilling costs 25 to 50%, and even a reduction short of this goal would mean appreciable savings.

A series of 10 tests at shallow depths, including tests in a 4,000-ft. well, have demonstrated that the tool is fieldworthy. Results of these preliminary tests indicate that bits are subjected to a wider range of loads and frequencies than had previously been considered possible, Howe said.





TAPE RECORDER sits atop 15-ft. tool (left). It's only 4 in. in diameter, has eight channels, can take four 30-second recordings.

How it's built . . . As shown in the sketch, the bottom-hole recorder is 6¾ in. in diameter and 15 ft. long.

The system includes an eight-channel tape recorder recently developed by the missile industry. The tape recorder is only 4 in. in diameter. It has a total recording time of 2 minutes which will be used initially to obtain four 30-second recordings.

The tool measures and records: Weight and torque on the bit; vertical, angular, and lateral accelerations; pressure inside and outside the drill pipe; and temperature. The measurements are made by means of strain gages whose electrical resistances change as they are stretched.

A transistorized electronics package in the center of the tool amplifies the signals from the strain gages prior to recording.

The timers are set to start the recording a certain length of time after the tool is run in the hole, and an automatic pressure switch insures that recordings are made only when drilling is in progress. Sixteen nickel-cadmium dry cells power the amplifiers, timers, and strain-gage circuits.

3. Fluid-entry detector

JERSEY'S fluid-entry analyzer solves the problem of determining the entry point of water, oil, or gas into a well bore.

The new tool not only spots the point of entry but identifies the fluid, H. L. Bryant, research drilling engineer, told the visitors.

How it works . . . Low-energy gamma rays emitted from a radioisotope pass through the fluid in the well bore.

A detector measures the intensity of radiation, and this indicates the density of the fluid.

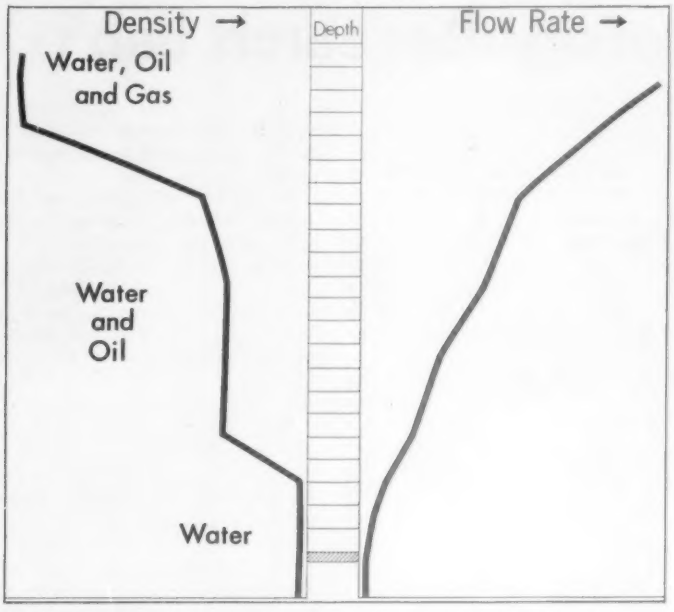
Since the fluids normally found in a well bore have densities that are pretty far apart, the tool can easily tell the difference between oil and water, and either of these two from natural gas present, Bryant said.

The tool can be calibrated to read directly in density units and will show the density of any mixture of two or three fluids in the well bore.

More applications . . . When used in combination with the inflatable-packer flowmeter developed by Humble Oil & Refining Co. (OGJ May 11, 1959, p. 104), engineers will be able to learn even more.

The combination tool will provide a record of the location, direction, and amount, as well as type, of fluid entering the well bore (see graph).

Field tests of the pool, alone and in combination with the Humble flowmeter, have been made in cooperation with Imperial Oil Ltd. in Canada.



TYPICAL RECORD of the fluid-entry analyzer used with the flowmeter. Scale at right shows increasing flow rate as tool is moved up-hole. Curve at left shows decreasing density as up-hole fluid changes from water to water and oil and, finally, to a three-phase mixture with gas.

Gas-oil contacts and water-oil contacts have been located in wells while producing and while shut in.

This service will soon be available through Birdwell Division of Seismograph Service Corp., Bryant said.

The tool can be run in a well on a wire-line logging cable through a pressure sealing lubricator. Any combination of the density logger and flowmeter may be used.

Operation . . . A record of a well's behavior is made by locating the tool at several points throughout a producing interval.

At each point the inflatable packer portion of the flowmeter is seated against the wall of the hole, whether the hole is cased or not. All fluid flowing in well bore then passes through flowmeter, rotating the spinner.

The rate of rotation and the direction show how much fluid is flowing at that point, and also the direction of the flow. This is done by a series of electrical pulses set up by the rotating spinner. The frequency of the pulses is an indication of the flow rate, and the pulse sequence shows the direction of spinner rotation, and hence the direction of flow.

Fluid density is measured simultaneously by the fluid-entry analyzer. The combined records of these two tools give the engineer all the information he needs to pinpoint well troubles or make workover recommendations.

Because of the versatility of the combination of these tools, additional applications will be found in the fields of well completion and repair, and in secondary-recovery-project evaluation, Bryant said.

4. Drilling-pressure chamber

WHAT actually happens when the tooth of a rock bit comes in contact with rock at the bottom of the hole?

Are the results the same as would be obtained on the surface under normal atmospheric conditions? Does pressure have some effect on the drilling characteristics of rock? How is the rock actually broken up?

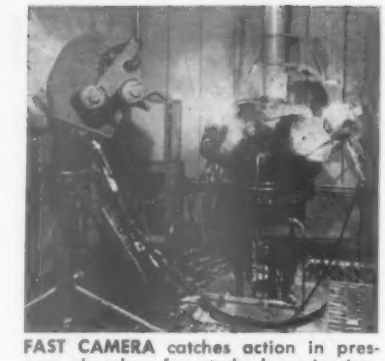
These and other questions are responsible for the birth of Jersey's high-pressure chamber for drilling research, W. S. Gatley, research drilling engineer, said.

Rock specimens can be subjected to pressures up to 15,000 psi. And all types of pressure that would be operating on the rock in a well bore can be simulated in the pressure chamber—overburden pressure, internal fluid pressure in the bore space, and drilling-fluid pressure.

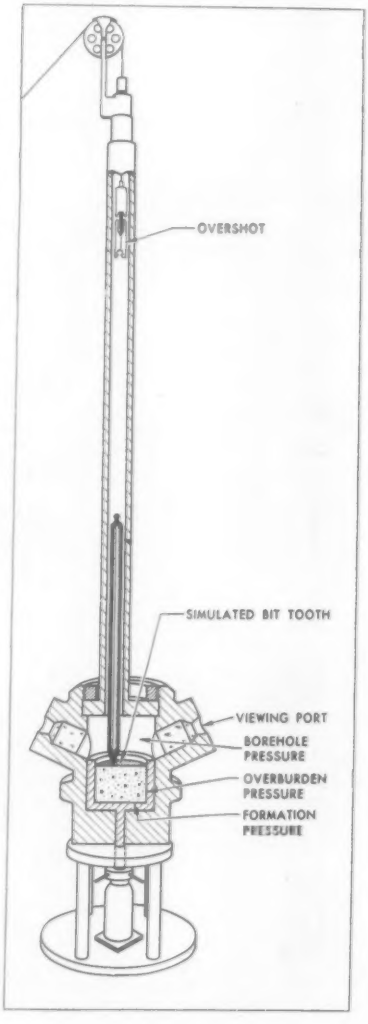
How it works . . . A chisel-shaped steel mandrel, simulating a tooth of a rock bit, is dropped on a sample of rock in the pressure chamber.

Since the falling chisel moves too fast to be observed accurately, a high-speed camera is used to photograph the action through one of four viewing windows. The camera can take pictures at the rate of 9,000 frames per second.

The apparatus has been in operation for about 1 month.



FAST CAMERA catches action in pressure chamber for study by scientists. Drawing below shows chamber design.



It's surprising what you find when you look for oil

. . . 12,000-year-old mammoth

AN oil-well drilling crew made an important discovery in Southwest Wyoming recently—but it wasn't oil. They found what turned out to be the skeleton of a mammoth.

Irving Hays, a driller for Delta Drilling Co., and his crew found the bones August 14 in the muck of a spring near Rawlins. At first, they thought the bones were sticks and started to throw them away before finally deciding to check them with an anthropologist.

Dr. George Agogino, assistant professor of anthropology at the University of Wyoming, went to the site and determined that the men really had discovered the remains of a mammoth. The giant animal had been buried for more than 12,000 years and was one of the best preserved ever found in Wyoming.

The professor observed, "It looks as if the animal went down to drink, got caught in the muck, and drowned. The bones have been well preserved by the muck of the spring.

Dr. Agogino plans further excavation at the site. He praised the oil crew for its alertness in saving the skeleton from destruction by checking with an anthropologist.

. . . 100-year-old Arctic cache

TWO Calgary oil geologists, exploring remote Devon Island, have discovered two notes left by the Sir Edward Belcher expedition into the Arctic more than 100 years ago.

George DeMille and R. A. Rudkin found the notes in cairns along Grinnell Peninsula 680 miles south of the North Pole. Both notes were dated in the summer of 1853 when Sir Edward commanded the Arctic search for the missing party of Sir John Franklin.

The first note was found in a tin container in a cairn flattened by frost and wolves at Point Disraeli, the northwest extremity of the island. It was on weathered paper and said Belcher had erected two monuments for surveying purposes and was leaving a cache of supplies. It also noted that Belcher's ship, the Assistance, would winter in Barrow Harbor.

The second note was found farther south at Point Hogarth. It was a short note in pencil on finer paper and said that Belcher had come ashore to inspect what he thought was a cairn but which turned out to be a natural rock formation.

The notes, shedding light on a long forgotten incident, have been turned over to authorities.

New call for an old idea:

Proration in California Urged

JOHNNY MITCHELL, a Houston independent whose operations expanded to the West Coast last fall, wants some Texas-type oil regulations adopted in California.

The Texan says unregulated oil production, coupled with the short-term crude contracts, is threatening to turn California into "an oil have-not state."

He is urging some form of market-demand proration law so that independents can have an assured market for their crude. He admits the volume of crude sold under ratable take would sometimes fall below what can be sold under unrestricted production, but he says a "steady flow" is better than operating with the fear that a crude contract will be cancelled.

Mitchell's proposal is not likely to get much serious support. California has defeated three conservation proposals since 1933.

The last proposal, called "Proposition 4," resulted in a fight which cost the industry much public understanding. Proposition 4 was defeated in 1957.

Current demand for California heavy crude is strong. This would tend to make the timing poor for any effort toward ratable-take legislation. Mitchell might have received some support several months ago when numerous contracts were cancelled because of a drop in demand.

Mitchell is president of Jade Oil Co., a producing firm with headquarters in Beverly Hills. He also is a partner in Christie, Mitchell & Mitchell Co., of Houston, which made a deal last fall to handle Jade's operations. He made his plea for a conservation law in a letter to Jade stockholders.

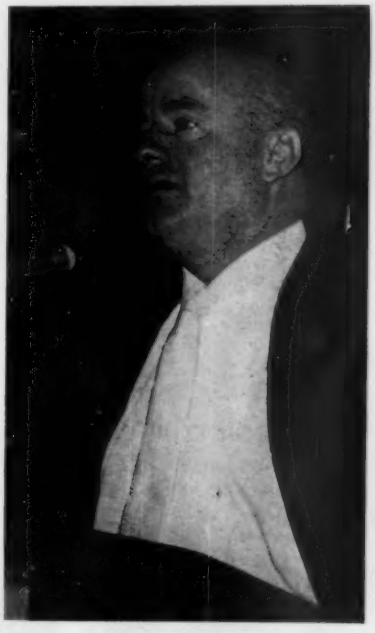
Mitchell says importers are the cause of the poor position of the independent in California.

They are using California crude only as a supplement to their imports, he says, and are able to hold down California's production or keep crude prices low since they have the power to cancel crude contracts on 30 days' notice.

However, the chances for any form of state control of oil in California seems remote.

Stark Fox, executive secretary of the Oil Producers Agency of California, sums up the prospects for a conservation law this way:

"In my opinion, regardless of the merits of such a plan, the potential situation is such that it would be impossible to enact such a law."



Johnny Mitchell
. . . Better a steady market for less.

PHOTOS IN THE **NEWS**

BP's New Pier

A 3-YEAR $18.2 million construction program at Angle Bay, Milford Haven, South Wales, has reached a climax with the opening of British Petroleum's new deep-water tanker terminal.

A 2,500-yd. jetty can handle the biggest tankers in BP's fleet, with crude pumped ashore to a tank farm built inside 100-year-old Popton Fort. The crude is delivered to the company's 70,000-bbl. Llandarcy refinery by pipeline.

Tires in Technicolor?

WHITE sidewalls are still the most popular way to dress up tires, but scientists are looking ahead. Milady, they think, may soon decide she wants a pastel color scheme on her automobile.

Esso Research scientists are developing special blends of many-colored butyl rubber and testing them for ease of cleaning, color retention, and ozone cracking.

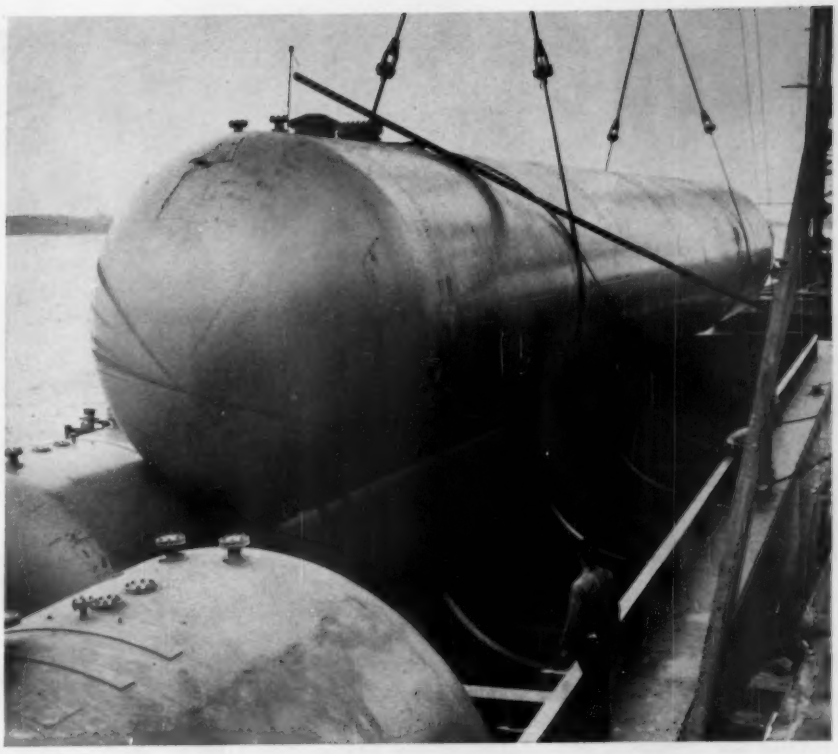
And the simplest way of checking is to put as many as 30 discs of different colors into one tire.

Biggest Barge

LAST of four cargo tanks is lowered into hull of 660,000-gal. high-pressure tank barge built for Union Texas Natural Gas Co.

Barge is one of a pair, which claim the distinction of being the world's biggest for moving LPG. Built by Avondale Shipyards, the barges are 273 ft. long and 41 ft. wide. Each has four tanks with a capacity of 165,000 gal. each and will move LPG at a pressure of 250 psi. on the inland waterways.

Tanks are 112 ft., 9½ in. long with a diameter of 16 ft., 3½ in. They're made of 1 9/16-in. steel plate.



Oil Men in Russia

SOVIET refining developments were getting a going-over at this session when a TASS photographer snapped the group in Moscow. The eight American oil executives (OGJ, Aug. 1, p. 79) making the trip began returning to the U. S. late last week after a 30-day tour of Russian oil operations. A 10-man Russian group will return the visit next month, spending 4 weeks visiting New York, the Philadelphia refining area, New Orleans and offshore operations, Houston, Bartlesville, Okla., and points on the West Coast. Other stops may be added before the itinerary is completed. No arrival date has yet been set by the Russians.

Edwin W. Pauley
. . . Back in marketing

Joe W. Perry
. . . He'll run the stations

Pauley Is Back in California Marketing

PAULEY Petroleum, Inc., a Los Angeles company headed by Edwin W. Pauley, officially is in the retail gasoline marketing business.

The company has been considering entering the retail field for several months and has been operating a pilot service station in the California resort town of Morro Bay (OGJ, Aug. 1, p. 82). Last week the company was operating two other stations. It has seven others either under construction or planned.

Gasoline is being sold under the brand name, "Pauley Blend," which identifies both the company and the multigrade marketing system it is following. Pauley is selling nine grades of gasoline.

Eventually the company plans to market all along the West Coast, but none of the stations now planned will be in Los Angeles proper. The company said it has no plans to buy out any company, but will build new outlets.

The Pauley stations market at independent prices and will be strictly gasoline outlets. They will handle no TBA business and do little other than a "quick oil change." Pauley's chief deputy in setting up the new marketing system is Joe W. Perry, executive vice president of Pauley Stations, Inc.

Pauley was in the marketing field for many years before selling the old Petrol Corp. in 1948. Since that time the company has operated primarily as an exploration and producing firm. Last year it purchased Newhall Refining Co., which operates a 3,000-bbl. refinery in the Los Angeles area.

INDUSTRY BRIEFS . . .

Refund payments ordered by the FPC have been completed by Colorado Interstate Gas Co. with the mailing of a fourth payment totaling $2,699,121. The payments were made to 12 wholesale natural-gas customers. The refunds are in settlement of 1958 and 1959 rate cases.

Common stock of Falcon Seaboard Drilling Co. has been listed on the American Stock Exchange. A total of 852,717 shares has been listed for trading. Ticker symbol for the stock is "FSD."

A Univac solid-state 80 electronic computer system is being installed in the Houston office of Transcontinental Gas Pipe Line Corp. Initially the computer will be used for data processing. Later the company expects to use it for engineering calculations.

First degrees for a 4-year course in petroleum land management were conferred last week on four students at the University of Oklahoma, Norman. The curricula was developed by the American Association of Petroleum Landmen. Graduates are William F. Brodnax, Camden, Ark.; Gary Boren, Elk City, Okla.; Frank Spooner, Stephens, Ark.; and Phil Houser, Laredo, Tex. W. Kenneth Sparks, Kaufman, Tex., will be graduated later this month from a similar course established at the University of Texas.

Interests in leases, including 30 wells, in four Texas-New Mexico fields have been purchased by Kern County Land Co. for $2.75 million from Ecland Oil Participation Corp., New York, and Hill & Meeker and Brown & Roper, both of Midland, Tex. Properties are in West World field, Crockett County; Mt. Susan South field, Tom Green County; Grice field, Loving County; and El Mar field, in Loving County, Texas, and Lea County, New Mexico. Ronald Yancey, Kern superintendent, has moved to Midland from Bakersfield, Calif., to direct the operations.

Market demand for North Dakota crude will hit a record 67,378 bbl. per day in September. Great Northern Refining Co.'s bid for 6,000 bbl. daily is determining factor in the increase.

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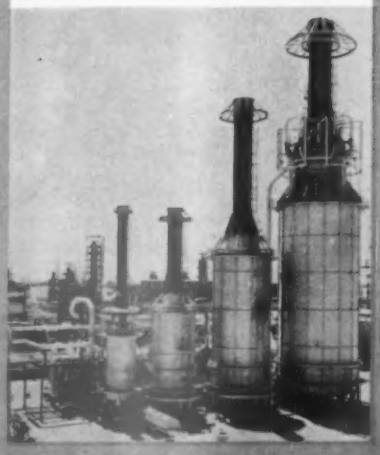

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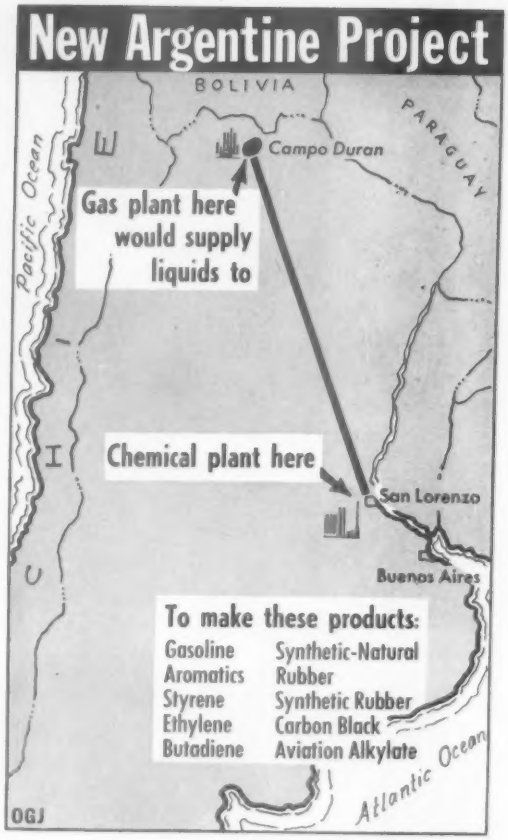
Petrochemical Complex Planned in Argentina

- Five U. S. firms want to build seven plants on the River Parana. The multi-million-dollar program could be completed in 3 years.



THE ARGENTINE Government has before it a plan for a $74.5 million petrochemical complex which five U. S. companies propose to finance, build, and operate.

The plan, if accepted, will help move Argentina along the road toward self-sufficiency in synthetic rubber and other products. And it will enable full use of:

. . . **Production** at Campo Duran near the Bolivian border.

. . . **A new gas plant** near Campo Duran.

. . . **A liquids pipeline** running 950 miles to the deepwater river port of San Lorenzo.

Fish International Corp., which built the pipeline, has joined four other companies in making the proposal to Argentina. The others are Continental Oil Co., Cities Service Co., United States Rubber Co., and Witco Chemical Co.

Those involved have arranged for the required financing and will be ready to go to work immediately upon getting approval of the Frondizi government. Fish obtained authority from the government last February to put the giant project together.

The complex would be located at San Lorenzo, about 200 miles up the Rio Parana from Buenos Aires. San Lorenzo is a few miles north of Rosario, Argentina's second largest city with a population of nearly 1 million.

Yacimientos Petroliferos Fiscales (YPF), the Argentine oil agency, has refining facilities at San Lorenzo. The petrochemical complex, however, would be owned and operated by PASA, an Argentine corporation formed this year by the five U. S. companies.

The units planned . . . At least seven plants or units would be erected at San Lorenzo to process products from the Campo Duran fields to the north.

A reformer would upgrade gasolines for motor fuels and aromatics. An extraction unit would extract the aromatics, and the benzene fraction would be used in a styrene plant.

Ethylene for the styrene plant would come from thermal cracking of propane.

A butadiene plant would take the mixed butanes through a dehydration unit to make butadiene, and the isobutanes would be separated out and used for production of aviation alkylate.

The butadiene and styrene would go into two synthetc rubber plants, one making a combination synthetic natural rubber and the other only synthetic (SBR).

The complex also would contain a carbon-black plant in conjunction with the rubber output.

Ultimately there would be other processing units to use byproduct raw materials.

The liquids line from Campo Duran can deliver up to 55,000 bbl. of butane, propane, natural gasoline, and other products daily. A parallel natural-gas line, which extends from Campo Duran to Buenos Aires, would furnish the fuel for the project. The gas line, like the liquids line, was built by Fish.

The output . . . The complex should meet much of Argentina's benzene and synthetic-rubber needs.

The country currently is importing benzene and natural rubber. Rubber requirements this year are estimated at 38,000 metric tons, and this should rise to 75,000 metric tons by 1965.

The complex is designed to produce 45,000 tons yearly of synthetic rubbers, 11,500 tons of carbon black, and a surplus 7,000 tons of styrene. Also it would produce 1,290 bbl. daily of aviation alkylate and 839 bbl. daily of benzene.

Fish estimates the first units could go on stream within 18 months of the government approval date. Completion of the entire complex would take 3 years.

Tierra del Fuego Oil Moves to Market

ARGENTINA is getting delivery of its first Tierra del Fuego crude.

Tennessee Gas Transmission Co., whose Argentine subsidiary produced the oil, reported last week that Argentina's portion of the island, on the southern tip of the continent, now has a production capacity of 19,000 bbl. daily. And there is now a total of 44 producing wells.

Movement of the crude was made possible by completion of a 2-mile, 14-in. crude-loading line.

The first tanker to deliver oil from Tierra del Fuego to Buenos Aires carried 98,385 bbl. of 41.8°-gravity crude and required 5 days to make the run. The delivery was marked by ceremonies attended by government and company officials.

West India Oil Hunt Proposed by Stanvac

STANDARD-VACUUM is winding up its exploration program in Bengal basin, but it still wants to look for oil in other parts of India.

The company has notified the government that it wants to withdraw from a 10,000-sq. mile concession in eastern India, where it has drilled 10 dry holes in the past 6 years. Stanvac has 75% interest in the project, and the government, 25%.

The move came at a time when the government continued to press the major marketers and refiners, Burmah-Shell, Caltex, and Stanvac, for further price reductions on imports. Any new concession won by Stanvac may be tied in with a general agreement with India on import prices and refinery expansion.

Total cost of the oil search in Bengal basin was about $17 million, with Stanvac's share coming to $13 million. The company spent another $1.5 million on preliminary work in the area, bringing over-all exploration costs to $14.5 million. It drilled 100,000 ft. of hole in drilling the dry wells.

Stanvac has an application pending on another 10,000-sq.-mile concession on the opposite side of the sub-continent in the Rajasthan region. This is north of the Cambay area where the government is evaluating a field discovery with the help of Communist equipment and personnel. Stanvac this time is seeking a concession in which it will have 100% ownership.

An opposite approach has been taken by the French. They have made a bid to do exploration work in two areas on a contractural basis for the Indian Government. The offer has been made by CFP, rather than by the Institut du Petrole, as originally reported (OGJ, Aug. 29, p. 64).

Price pressure . . . The government, goaded by a left-wing minority in Parliament is still seeking a further price reduction on imports, which the government says are not competitive with Russian offers of cheap crude.

At the same time, India is determined to maintain good relations with Middle East oil-producing countries. Reports from New Delhi indicate the government is taking seriously complaints from the Persian Gulf over price cuts, which in part resulted from the action in India.

Particular attention is being paid to a statement by Shaikh Abdullah Tariki, director general of Saudi Arabian oil affairs, who says his country stands to lose from $25 to $30 million a year because of the price cuts.

There also are reports that the composition of the Soviet crude offered India cancels out any price advantage over Middle East crude. It is believed to have a low yield of middle distillate, for which there is a large and growing demand.

The major companies last month reduced the price of imports to India by 11% and 12%, or about 27 cents per barrel.

Naft Khaneh Oil Exports Set by Iraq

THE IRAQ Government plans to export crude from its Naft Khaneh field via a pipeline hook up with Iraq Petroleum Co.'s system to the Mediterranean.

The Ministry of Oil has been authorized to start talks with IPC to establish costs for pumping, loading, storing and exporting oil using IPC facilities terminating at Banias, Syria.

Naft Khaneh, on the Iranian border, is the only production in Iraq not handled by IPC. The field is on a 753-sq. mile concession relinquished 2 years ago by Khanaqin Oil Co., an affiliate of British Petroleum.

Russian experts have told the government the field has a primary recovery of from 49 to 126 million barrels, with additional recovery of 196 million barrels with a water-flood program.

Naft Khaneh actually straddles the Iraq-Iran border. It now produces about 4,000 bbl. daily on the Iraqi side and a little more on the Iranian side, where it is called Naft-i-Shah. BP gave up the concession because output did not reach 40,000 bbl. daily by a time specified under a former agreement.

Iraq originally planned to build a pipeline to IPC's K-2 pumping station, a distance of about 140 miles. At the suggestion of the Russians the government now intends to build a link to K-3 station via Baghdad. This will enable Naft Khaneh crude to supply a 30,000 bbl. refinery owned by the government. This project would require roughly an 80-mile line to Baghdad with a 130-mile extension to K-3 station. The refinery is now fed from a feeder from K-2.

FOREIGN BRIEFS . . .

A Japanese maleic anydride plant, to be built by Miike Gosei Chemical Industry Co., will have a design capacity of 8,000,000 lb. per year. The Scientific Design Co. process of fixed bed, catalytic, air oxidation of benzene will be used.

Thailand's first catalytic cracking unit will be built on the Choa Phraya River outside Bangkok by the Defense Energy Department of Thailand. The 2,000-bbl. unit has been licensed by Houdry Process Corp. Completion date is late 1961.

A butyl plant with a capacity of 30,000 tons per year will be built by Esso Petroleum near its Fawley refinery. The $12-million plant is expected to meet the entire demand for butyl in United Kingdom for some time. The unit will go into operation in 2 to 3 years.

Acidizing in Pakistan's Karsal field No. 3 discovery well has been disappointing. Flow failed to rise above 250 to 300 bbl. daily. The well came in at 800 to 1,000 bbl. daily last year but output gradually declined. Karsal 4, a half-mile due west is drilling ahead below 5,000 ft. The well is being drilled jointly by Pakistan Petroleum and Pakistan Oilfields.

The Japanese-owned Arabian Oil Co. is asking the government to help it move from 500,000 to 600,000 tons of Neutral Zone crude it plans to bring to Japan the first quarter of 1961. This is about 40,000 to 49,000 bbl. daily for the period. The company wants the government to allocate 80% of the oil to all Japanese refiners.

Esso Libya is moving a rig back into Block 1 in Fessan where it earlier drilled 12 wells, including the first oil discovery in Libya. The original find, Atshan 2, was non-commercial because of the great distance to the coast. An affiliated company, Esso Sirte, is drilling its first wildcat on Block 16, less than 5 miles from the Mediterranean Coast of Tripolitania.

World Output Is Off

- **Total production in June drops a little. But new highs are recorded in Iraq and Indonesia.**

CRUDE PRODUCTION outside the U. S. slipped in June, but output of more than 10.5-million barrels daily still was the second highest on record.

Middle East output dipped as declines in Kuwait and Iran offset a gain in Saudi Arabia and an all-time record in Iraq. In the Western Hemisphere, both Canadian and Venezuelan operators had lower production.

In the Far East, Indonesian production was at an all-time high with Caltex production at a peak of 228,100 bbl. daily. Stanvac produced 78,200 bbl. daily. Royal Dutch-Shell has been averaging 117,700 bbl. daily. Another 17,500 bbl. daily is produced by the government. Of this, 17,000 bbl. daily is from North Sumatra, and 500 bbl. daily from Java.

Egyptian production is now supplemented by Ras Bakr field, which went into commercial production in March. The government-operated field in June averaged 5,000 bbl. daily from 15 flowing wells. It is located on the mainland near the Red Sea.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total free world outside U. S.
1959			
June	4,112.6	4,466.8	9,463.4
July	3,914.8	4,532.5	9,293.2
August	3,862.1	4,659.7	9,344.9
September	3,887.5	4,635.5	9,396.4
October	4,069.6	4,699.2	9,629.8
November	4,123.2	4,820.7	9,877.9
December	4,218.5	4,682.0	9,861.5
1960			
January	4,316.5	5,065.3	10,334.7
February	4,389.5	4,986.5	10,313.2
March	4,156.4	5,146.3	10,346.8
April	4,069.5	4,925.5	10,055.1
May	4,317.4	5,286.2	10,680.2
June	4,248.8	5,164.5	10,533.8

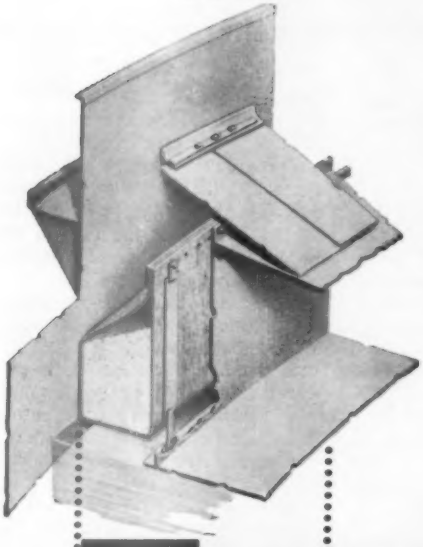
World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	June 1960	May 1960	June 1959
Western Hemisphere			
Argentina	156.9	160.8	119.6
Bolivia	8.4	8.2	9.0
Brazil	76.0	76.0	68.9
Canada	497.0	544.0	497.9
Chile	18.9	18.9	17.2
Colombia	155.9	156.8	148.0
Cuba	0.2	0.2	0.5
Ecuador	7.8	7.8	7.5
Mexico	267.1	267.1	260.3
Peru	52.2	52.2	48.6
Trinidad	120.3	120.3	112.8
Venezuela	2,888.1	2,905.1	2,822.3
Total	4,248.8	4,317.4	4,112.6
Europe			
Austria	46.0	46.3	46.4
France	39.5	38.9	32.1
West Germany	106.9	108.5	100.7
Italy	39.4	32.9	32.7
Netherlands	36.5	35.1	33.7
United Kingdom	1.7	1.7	1.5
Yugoslavia	17.8	17.0	11.5
Total	287.8	280.4	258.6
Middle East			
Bahrain	45.0	45.1	45.2
Iran*	961.0	983.0	949.0
Iraq†	1,010.5	958.6	823.3
Israel	2.0	2.0	2.0
Kuwait	1,595.5	1,787.6	1,268.1
Neutral Zone	131.0	131.0	119.3
Qatar	172.7	149.4	167.3
Saudi Arabia	1,240.4	1,223.1	1,084.8
Turkey	6.4	6.4	7.8
Total	5,164.5	5,286.2	4,466.8

Country—	June 1960	May 1960	June 1959
Other Asia			
British Borneo	105.0	105.0	114.0
Burma	10.5	10.5	10.6
India	8.5	8.5	8.5
Indonesia	441.5	422.7	370.1
Japan	9.7	9.1	7.7
New Guinea	4.5	4.5	4.3
Pakistan	5.9	5.9	6.2
Total	585.6	566.2	521.4
Africa			
Algeria	153.6	132.4	19.2
Angola	1.2	1.2	0.9
Egypt	59.9	64.0	58.4
Gabon	15.0	15.0	14.6
Morocco	1.9	1.9	1.9
Nigeria	15.5	15.5	9.0
Total	247.1	230.0	104.0
Free World			
Foreign	10,533.8	10,680.2	9,463.4
United States	6,939.0	6,848.0	7,083.0
Total	17,472.8	17,528.2	16,546.4
Communist Countries in Soviet Orbit			
Romania	231.0	231.0	229.0
Russia	2,850.0	2,850.0	2,490.0
Other Communist	100.0	100.0	60.0
Total	3,181.0	3,181.0	2,779.0
WORLD TOTAL	**20,653.8**	**20,709.2**	**19,325.4**

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking. *Includes estimated 6,000 bbl. daily from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,500 bbl. daily from Naft Khaneh field, operated by Iraq Government.

FIRST solid cushion seal



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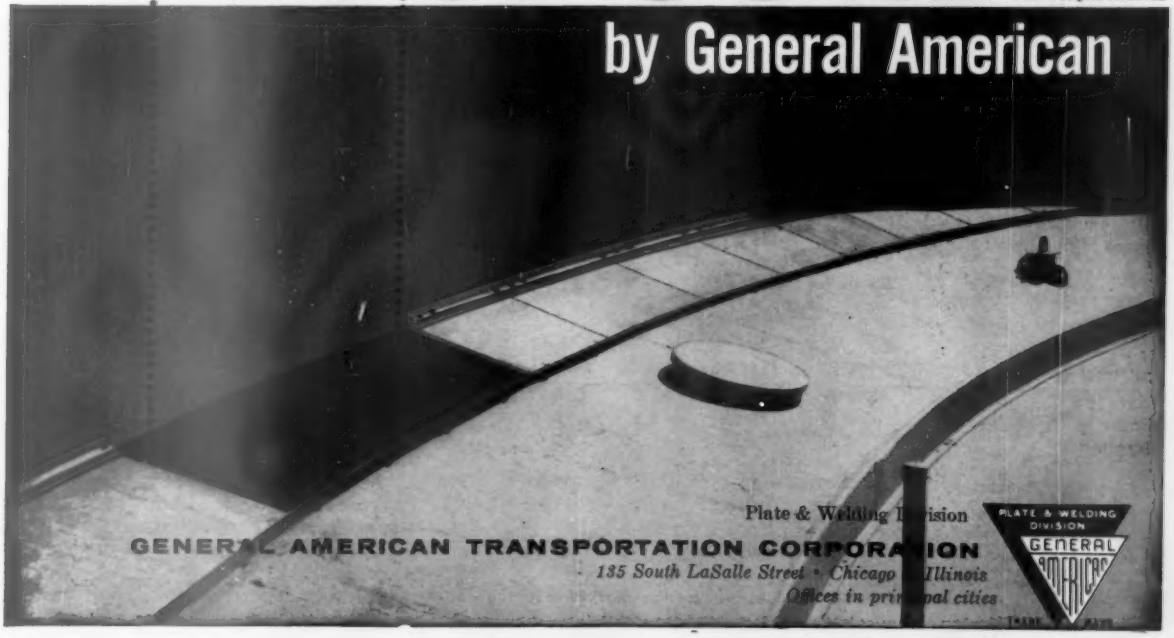

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Big surge in U. S. petrochemical building projects may be last pre-maturity fling

Future growth rates should begin to approach gross-national-product rate

THIS eighth annual survey of petrochemical plants and construction projects by The Oil and Gas Journal shows that building is at an all-time high this year. And well over half of the newly announced projects are to be located on the Gulf Coast with major emphasis on polyolefins, synthetic-rubber, and styrene facilities.

Although actual petrochemical production should approach 56.1 billion pounds, the growth rate in 1960 is estimated to be only half of last year's 20.7% (Table 1). Petrochemical production is expected to be 30.3% of total chemical production of 185.0 billion pounds in 1960. Value of these petrochemicals is expected to hit $6.88 billion, 61.3% of the total value of all chemicals produced—$11.23 billion.

BY HUGH S. PYLANT
Petrochemical and Gas-Processing Editor

Over-all growth trend for petrochemicals has been slightly downward since 1955, as can be seen in Table 2, and is expected to decrease more rapidly in the next 5 years. Predicted growth rate for the period 1960-1965 is 8.7%. This compares with 12.0% for 1945-1950, 15.0% for 1950-1955, and 11.3% for 1955-1960. Even so, total petrochemical production in 1965 is expected to be 85.0 billion pounds.

This declining growth trend would seem to bear out the belief of some that the petrochemical industry in this country is reaching maturity and that future growth rates should begin to approach the gross-national-product rate. This belief can be further borne out by examining the present major outlets for petrochemical materials:

- **Synthetic rubber** will account for approximately 70% of the estimated 1.65 million tons of rubber used in the U. S. this year.
- **Synthetic detergents** have replaced all but 25% of the soap market.
- **Synthetic fibers** have saturated the textile field to the extent that new synthetics are replacing other synthetics.
- **Plastics** have pretty well taken over the packaging field, the biggest volume market for these materials, and the new polypropylene is threatening to take over some of the market for linear polyethylene.
- **Export markets** are falling off as foreign countries get their own petrochemical-production facilities.

The situation boils down to this: The big, easy pickings have already been had and any future over-all gains will be more difficult and will require a lot of research and application development.

TABLE 1—U. S. PETROCHEMICAL PRODUCTION—1960 VS. 1959

(In billions of pounds)

Petrochemicals—	1958	1959	Per cent increase 1958-59	Est. 1960	Per cent increase 1959-60
Aliphatics	26.3	32.0	21.7	35.2	10.0
Aromatics	4.4	5.2	18.2	5.9	13.5
Inorganics	11.4	13.6	19.3	15.0	10.3
All petrochemicals	42.1	50.8	20.7	56.1	10.4
All chemicals	152.0	174.0	14.5	185.0	6.3
Petrochemicals as per cent of all chemicals	27.7	29.2	....	30.3	....

(In billions of dollars)

Petrochemicals—	1958	1959	Per cent Increase 1958-59	Est. 1960	Per cent increase 1959-60
Aliphatics	$ 3.95	$ 4.80	21.5	$ 5.28	10.0
Aromatics	0.76	0.88	15.8	1.00	13.6
Inorganics	0.41	0.54	31.7	0.60	11.1
All petrochemicals	5.12	6.22	21.5	6.88	10.6
All chemicals	9.19	10.40	13.2	11.23	8.0
Petrochemicals as per cent of all chemicals	55.7	59.8	....	61.3	....

(Table prepared for The Oil and Gas Journal by the market research department of Union Carbide Chemicals Co.)

CONSTRUCTION

The Oil and Gas Journal's survey of petrochemical plants in the U. S. shows 118 new-construction projects planned or under way compared to 47 listed in last year's survey. These new projects are pretty evenly divided between new plants and expansions to existing plants, with a slight edge going to the expansions.

This eighth annual survey shows that 73 of the newly announced projects are being carried out by chemical companies, 32 by oil companies, and 13 by joint chemical and oil-company concerns.

Although there is no particular excess-capacity problem at present, this

is expected to show up as the present round of expansions is completed, particularly among basic materials such as olefins and aromatics. Serious excess capacity almost always leads to increased competition for available markets with resultant price cuts and lower profit margins for the manufacturers. To safeguard against this, oil companies, the largest producers of these basic materials, are beginning to integrate forward more into the manufacture of intermediates and end products, thus using a big part of their output of basics captively. (See Table 4.)

Gulf Coast

More than half of the presently announced new plants and expansions are taking place along the 700-mile strip of coastal land that ranges up to 100 miles in width and stretches from Brownsville, Tex., to New Orleans. There are more than 100 major petrochemical plants already located here.

Interviews with some of the leading petrochemical producers in this area indicate that the big reasons for the continuing buildup of this industry on the Gulf Coast are the nearby and readily available supply of raw materials from refineries and gas fields; a plentiful supply of cheap natural gas for fuel; ample supplies of fresh water, sulfur, salt and lime; and ready access to water transportation for the plant products either by ocean-going tanker or river barge. Also many of these plants are dependent on other plants for interchange of raw materials and byproducts, so there tends to be a snowballing effect.

Polyolefins are riding high on the new wave of construction with 11 projects planned for this area. The completion of these projects will bring another 433 million pounds of capacity on stream, some of which is expected to be excess. Among the larger expansions are: (1) Union Carbide's planned projects at Seadrift and Texas City, Tex., for an additional combined capacity of 170 million pounds of low-density polyethylene (this makes Union Carbide the world's largest producer of polyethylene with total capacity exceeding 600 million pounds); (2) Hercules Powder's new plant at Lake Charles, La., to produce 100 million pounds of polypropylene; and (3) Dow Chemical's almost-completed facilities at Plaquemine, La., for the production of 50 million pounds of polyethylene.

The biggest market for polyolefins is in packaging. Approximately 40% of the polyethylene and 27% of the polypropylene manufactured this year will be channeled into this end use. By 1963 it is expected that almost 50% of all polyethylene and polypropylene production will be consumed for this purpose.

Synthetic rubber is also being expanded at a rapid pace with 196,000 long tons of capacity now under construction in eight different projects in this area. This figure breaks down into 71,000 tons of styrene-butadiene-rubber (SBR), 85,000 tons of polyisoprene-polybutadiene, and 40,000 tons of butyl rubber.

A recent trend among SBR manufacturers is the increase in master batching, a process in which carbon black and oil are mixed with the copolymer during the production cycle. The 25,000-ton expansion of masterbatch facilities by United Carbon Co. at Baytown is an example of this. Most of the producers are unhappy

TABLE 2—PETROCHEMICALS—PRODUCTION AND GROWTH RATES
(Production in billions of pounds)

	Aliphatics	Aromatics	Inorganics	Total petrochemicals
1945	5.4	1.4	2.35	9.15
1950	11.8	0.95	3.4	16.1
1955	20.1	3.2	9.5	32.8
1958	26.3	4.4	11.3	42.0
1959	32.0	5.2	13.6	50.8
1960 est.	35.2	5.9	15.0	56.1
1961 est.	37.5	6.0	15.2	58.7
1965 est.	60.0	8.0	17.0	85.0
Growth Rate Per Cent Per Year				
1945-1950	17.0	....	8.0	12.0
1950-1955	11.6	28.0	23.0	15.0
1955-1960	11.9	13.0	9.6	11.3
1960-1965	11.3	6.3	2.5	8.7

TABLE 3—U. S. OLEFIN DEMAND
(In millions of pounds)

	1950	1955	1958	1959	1960	1965
Ethylene (total)	1,500	3,000	4,200	4,900	5,100	7,000
"Chemical" ethylene*	1,400	2,500	3,300	3,400	3,800	5,200
Propylene (total)	900	1,400	1,900	1,950	2,000	2,800
Butylenes	1,250	2,550	2,650	3,100	3,490	4,300

*Excludes polyethylene requirements.

Growth Rate Per Cent Per Year

	1955-1960	1960-1965
Ethylene	10.7	7.1
Propylene	7.4	7.1
Butylenes	6.6	4.4

INVESTMENTS IN EUROPEAN PETROCHEMICAL FACILITIES
(Millions of U. S. dollars)

	Dec. 31, 1957	End of 1960	Per cent expansion
France	69	280	306
West Germany	173	293	69
Italy	78	188	141
Netherlands	16.5	23	39
United Kingdom	212	393	85
Total	548.5	1,177	115

Source: U. S. Department of Commerce.

TABLE 4—BREAKDOWN OF NEW BUILDING PROJECTS

	1959		1960	
	Basics	Intermediates and end products	Basics	Intermediates and end products
Oil companies	6	10	14	18
Chemical companies	4	22	9	64
Joint enterprises	1	4	4	9
Total	11	36	27	91

about the trend, because this new technique not only increases their production problems, but also cuts down on the revenue per pound of pure copolymer since the purchase is not willing to pay much for this additional processing.

It is interesting to note that a big part of the building in synthetic "natural" rubber (polyisoprene) is being carried out by rubber companies that have large rubber plantations in South America and the East Indies (OGJ, July 18, p. 68). This would seem to indicate that the rubber growers expect this new synthetic product to make big inroads into the natural product market.

Styrene capacity in this country will be increased by 35% when the present round of construction on the Gulf Coast is completed. Five projects now building or planned for the near future will add 520 million pounds to the existing 1,500 million pounds of capacity. The largest of these projects is a 100-million-pound expansion by Monsanto at Texas City which will put this company into second place with 560 million pounds of styrene capacity. Dow Chemical is the top dog in this field with present capacity of 550 million pounds which will be raised to 800 million pounds on completion of expansions at Freeport, Tex., and Midland, Mich.

The big surge in styrene facilities probably stemmed from several things: Polystyrene molding and extrusion compounds, the biggest outlet for styrene, have a distinct price advantage over other plastics for many uses, costing about 21 cents per pound compared to 35 cents for polyethylene, for example. Production of SBR, another big user of this chemical, is booming and should have an estimated styrene consumption of 495 million pounds this year. Also, styrene prices have become more stable since the introduction of the Hydeal process by Universal Oil Products and Ashland Oil in which benzene, for the ethylbenzene-to-styrene route, will be produced from readily available toluene or xylene.

East Coast

The 26 projects now under way or planned in the East Coast area are mostly divided among polyolefins, synthetic rubber, vinyls, naphthalene, and maleic anhydride with a scattering of other miscellaneous chemicals.

Naphthalene is probably the only petrochemical being made exclusively in the East (OGJ, Aug. 8, p. 54). Historically, the coking and coal-tar-distilling industries have been the sole source of this chemical which goes mostly into the production of phthalic anhydride. Since coke plants were built in the East near steel mills, phthalic anhydride plants were built there also. So until new phthalic anhydride plants are built in other parts of the country, it isn't likely that petroleum-derived naphthalene plants will be either.

Chemical producers in the East are being faced with a problem that may seriously affect their profit picture in the near future. Refinery gas for chemical raw material is becoming scarce, and more and more manufactures are going to have to turn to higher-priced naphtha and natural gas for feed stock.

West Coast

The petrochemical industry is still in its infancy on the West Coast, but the area is shaking loose from some of the bonds which held back growth in the past.

Currently, 11 building projects are going on in California, Washington, and Oregon. This is small compared to the Gulf Coast, but the area is one of promise for petrochemical manufacturers.

Geography is the big bugaboo facing West Coast companies. Local consumption is growing, but in order to make a plant economical it must be large enough to be competitive in any domestic market. And for a manufacturer in this area, this means absorbing high shipping costs on a big part of the production. East Coast companies face this same problem, but in many cases they are able to market most of their product in eastern states and pay the high freight charges on only a small percentage of their output.

At one time a lack of natural gas held back the petrochemical industry on the West Coast, but with the recent completion of large-volume transmission lines, plants can now get plenty of low-cost gas from distant large gas-producing areas.

Most of the big names in petrochemicals are represented on the West Coast, but operations generally are smaller than elsewhere.

U. S. capital and know-how are playing a big part in the petrochemical buildup overseas.

Australasia

This broad geographical grouping includes such countries as Australia, Formosa, India, Indonesia, Iran, Iraq, Israel, Japan, Korea, Malaya, and Pakistan.

In this area are found some of the world's largest reserves of oil and gas, along with a big percentage of the world's population. The combination of these two factors could eventually lead to a major concentration of petrochemical industry. There are at present 50 petrochemical-construction projects under way or planned and the beginning is still in sight for most of these countries.

- **Australia** will see its first big year of petrochemical production in 1961 with the completion of the SBR copolymer plant of Australian Synthetic Rubber Co., styrene facilities of Australian Petrochemicals, Ltd., and CSRC-Dow, Pty., Ltd., and the ethylene-butadiene plant being completed by Vacuum Oil, Pty., Ltd.
- **Japan's** 5-year-old petrochemical industry is bursting out all over with 26 new-construction projects announced. Olefins, polyolefins, and synthetic fibers are leading the way with expanded facilities planned by such companies as Mitsubishi Petrochemical Co., Ltd., Nippon Petrochemical Co., Ltd., and Showa Denko, K.K.

Also, a huge $400-million petrochemical expansion project is planned by the Sumitomo Zaibatsu, a group of Japanese companies including Sumitomo Chemical, for the production of polyolefins, ethylene oxide, PVC, styrene, acrylonitrile, and others from petroleum naphtha.

Canada

The Canadian petrochemical industry is straining even harder this year to meet the country's skyrocketing demand for its products. By 1965 this demand is expected to double last year's 2¼ billion pounds. Sulfur still heads the list of large-volume petrochemicals, but plastics and resins are moving up fast with capacity estimated to top 500 million pounds in the next 5 years.

The big role being played by the United States in Canada's petrochemical development can be seen in that 14 of the 21 construction projects now under way or planned are by U. S.-affiliated companies. Augmenting this role further, six new gas-processing and sulfur-recovery plants are being built as the result of approval to export over 1 billion cubic feet daily of natural gas to the U. S. from Canada's western provinces.

However, the Canadian companies are not standing around waiting for U. S. capital and know-how. They are surging ahead with big projects such as: Canadian Chemical Co.'s $4-million expansion at Edmonton where more than 19 different petrochemicals are produced, and Polymer Corp.'s planned 20,000-ton polybutadiene synthetic-rubber plant at Sarnia, Ont.

Communist Bloc

Available information on these countries indicates very moderate petrochemical growth compared to the free-world countries. The 14 known

THE EUROPEAN petrochemical industry is growing by leaps and bounds as it attempts to catch up with an ever-increasing demand for petroleum-derived chemicals.

construction projects that are planned or under way are mostly for the production of ammonia, plastics, and synthetic rubber. A large part of the equipment and know-how for these facilities is being bought from countries like the United Kingdom, West Germany, Italy, and France.

Latin America

Foreign capital, mostly U. S., is helping to make these countries self-sufficient in chemical manufacture. At present, 9 petrochemical construction projects are under way and 16 others are planned. Out of the 25 announced projects, U. S. firms are involved in 10.

As would be expected in a predominantly agricultural area, facilities for the manufacture of ammonia are leading the parade, but polyethylene and carbon-black plants are close behind, indicating an increasing market for consumer goods.

The most optimistic planner seems to be Argentina with five projects still in this stage, followed by Brazil and Colombia with four each. Mexico is doing the most building with four projects now under construction.

- **Among Argentina's** big projects is a plant now under construction at La Plata for the manufacture of ethylene, polyethylene, and styrene. These facilities are being built by Koppers Co. and private Argentina interests. Two other big projects still in the planning stage are facilities for the production of SBR synthetic rubber, carbon black, and ammonia to be built by Fish International, Continental Oil, Cities Service, and Witco Chemical; and a plant to manufacture polyethylene and phthalic anhydride proposed by Imperial Chemical Industries.
- **In Brazil,** Firestone Tire & Rubber and Goodyear Tire & Rubber are building a synthetic-rubber plant near Rio de Janeiro, and Cia. de Carbonos Coledais is planning a large carbon-black plant at Mataripe.
- **The Mexican** government-owned Petroleos Mexicanos is constructing a polyethylene plant near Mexico City; facilities for producing dodecylbenzene, butadiene, styrene, SBR copolymer, ethyl chloride, and ethylene dichloride near Tampico; and ammonia and aromatics extraction plants at Minatitlan.

Western Europe

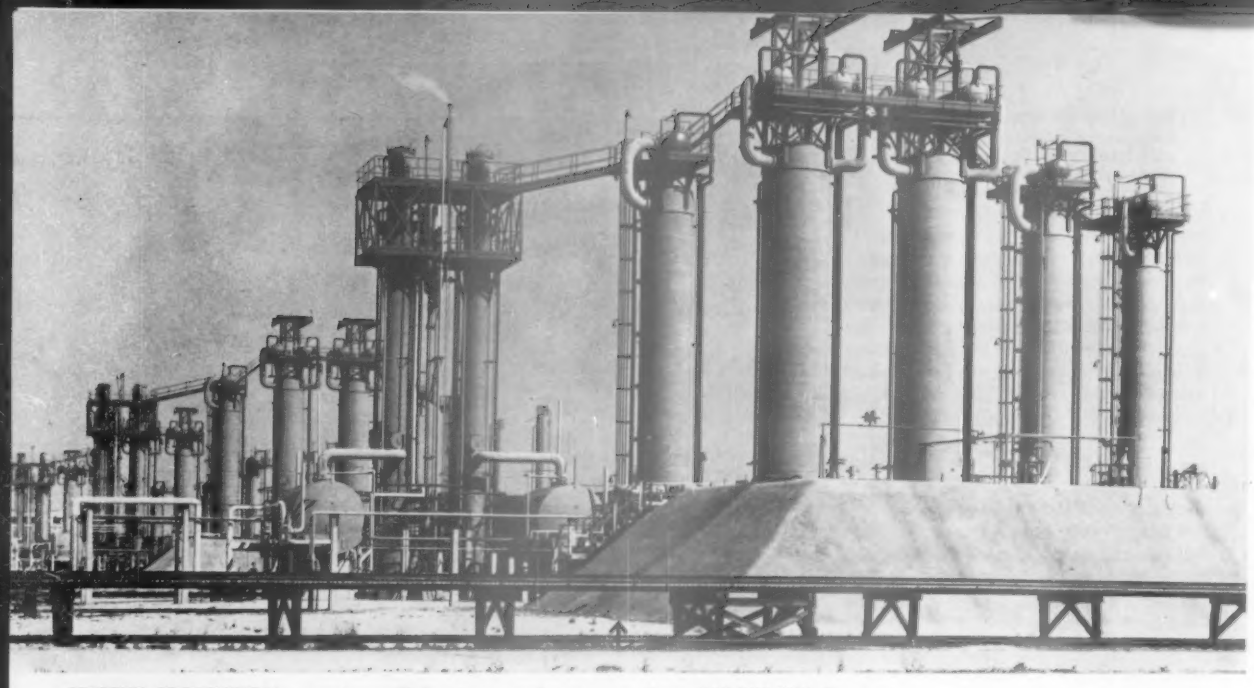
The European petrochemical industry is growing by leaps and bounds as it attempts to catch up with an ever-increasing demand for petroleum-derived materials. Production, in terms of carbon content, will have grown from about 208,000 metric tons in 1953 to an estimated 2 million metric tons by the end of 1961.

According to The Oil and Gas Journal's World-Wide Petrochemical Survey, western European countries now have planned or under way, 91 new-construction projects. This is a 41% increase over last year. It is interesting to note that U. S. companies will participate in 27 of these projects. This is indicative of the interest U. S. concerns have in wanting to fully participate in the growth that is taking place in the European Common Market area.

These plans for new and expanded facilities are expected to increase the total investment in the petrochemical industry of the five countries most active in this area to an estimated $1.2 billion (see accompanying table). This is up from $240 million in 1953.

Of the five largest petrochemical-producing countries, the survey showed that France has announced 22 new projects, Italy 18, the United Kingdom 13, and West Germany and the Netherlands 12 each. Products receiving the most attention were polyolefins, olefins, synthetic rubber, ammonia and urea, and carbon black in that order.

- **In France,** the petrochemical industry was given a big shot in the arm with the discovery of Lacq gas field. This huge supply of natural gas is giving rise to a community of plants such as Aquitaine Chimie, Azolacq, Ste. Nationale des Petroles d'Aquitaine, and Ste. Vinylacq which are building facilities for production of ammonia, acetylene, methanol, vinyl chloride and sulfur.
- **Germany** is still dependent to some extent on coal tar and calcium carbide for its chemical raw materials, but petroleum-based products are rapidly taking over as evidenced by the new olefin plants being built and expanded by Farbwerke Hoechst, A.G., Rheinische Olefinwerke, G.m.b.H., Esso, A.G., and Feldmuble.
- **In Italy,** as elsewhere, the biggest chemical activity seems to be in the field of petrochemicals. A new complex has gone up at Priolo in Sicily for the production of olefins, polyolefins, and derivatives. Also, Montecatini is in the middle of a huge construction project at Brindisi to manufacture its new ethylene-propylene and ethylene-butylene copolymers, polyolefins, alcohols, and other petrochemicals.
- **In the Netherlands,** Royal Dutch-Shell is planning the first commercial facilities in Europe for producing polyisoprene and polybutadiene. Other large projects in the mill include a carbon-black plant at Rotterdam to be built by Ketjen Carbon, Ltd., and SBR latex facilities, also at Rotterdam, to be constructed by Nederlandsche Dow Maatschappij, N.V.
- **The British** petrochemical industry is fighting hard to retain its second-place position in the world with another round of construction projects. The complex at Grangemouth, Scotland, is undergoing big expansions by British Hydrocarbon Chemicals, Ltd.; British Petroleum Co., Ltd., is expanding facilities at Wilton and has plans for a new complex near Avonmouth; and Shell Chemical Co., Ltd., has a big expansion project under way at its Carrington Works.



STYRENE PRODUCTION capacity will be increased to more than 800,000,000 lb. per year by Dow Chemical Co. at its Freeport, Tex., and Midland, Mich., plants. This styrene purification plant at Freeport will play a part in the expansion which is scheduled for completion by late 1960 or early 1961.

THE OIL AND GAS JOURNAL'S 1960 SURVEY OF

Petrochemical plants in United States

ALLIED CHEMICAL CORP., 61 Broadway, New York 6, N. Y.
Plant: General Chemical Division, Bayonne, N. J.
Product: 30 tons per day of sulfur from refinery gas.
• Construction: Allied reportedly will complete a fluorocarbon plant early in 1961, with capacity of 35,000,000 lb. per year.
Plant: General Chemical Division, Richmond, Calif.
Product: 100 long tons per day of sulfur from refinery gas.
Plants: National Aniline Division, Buffalo, N. Y., and Moundsville, W. Va.
Raw material: Kerosine fraction, white oil fraction, benzene, toluene, xylene, and natural gas.
Products: Alkyl aryl sulfonates (water soluble), long chain alkyl aryl sulfonates (oil soluble), dodecyl-benzene, aniline, maleic anhydride, fumaric acid, diisocyanates, dyestuffs, nitrotoluenes, and toluidines.
Plant site: National Aniline Division, Irmo, S. C.
• Construction: Plant to produce fine-denier nylon yarn will be built here, with completion late 1961.
Plant: Nitrogen Division, Hopewell, Va.
Raw material: Natural gas.
Products: Ammonia (1,100 tons per day), ammonium nitrate-limestone, pebbled ammonium nitrate, nitrogen solutions, sodium nitrate, and nitrogen tetroxide.
• Construction: Expansion here reportedly includes caprolactam facilities.
Plant: Nitrogen Division, La Platte, Neb.
Raw material: Natural gas.
Products: Ammonia (210 tons per day), urea (300 tons per day), and nitrogen solutions.
Plant: Nitrogen Division, Orange, Tex.
Raw material: Ethylene.
Products: Ethylene glycol, polyglycols, ethylene oxide, and ethanolamines.
Plant: Nitrogen Division, South Point, Ohio.
Raw material: Natural gas.
Products: Ammonia (875 tons per day), urea (300 tons per day), nitrogen solutions, high-analysis granulated fertilizer, methanol, and formaldehyde.
• Construction: Expansion under way for 50% increase in capacity of methanol and 35% increase in formaldehyde capacity, with completion expected early 1961.
Plant: Plastics and Coal Chemicals Division, Frankford, Pa.
Raw material: Propane-propylene blend.
Products: Phenol and acetone.
Plant: Semet-Solvay Petrochemical Division, Tonawanda, N. Y.
Raw material: Ethylene from residual oil fraction.
Products: Polyethylene resin pipe compound and high-melting-point polyethylene wax. (Polyethylene capacity here is reportedly 20,000,000 lb. per year.)
• Construction: Capacity is being expanded about 25% in 1960.
Plant site: Semet-Solvay Petrochemical Division, Orange, Tex.
• Construction: In June 1960, the company announced plans to build facilities here to boost output of the company's low-molecular-weight polyethylene 50%. Construction is under way. In January 1960, Allied announced plans for a high-density polyethylene plant at Orange, for completion mid-fall 1960.
Plant: Solvay Process Division, Moundsville, W. Va.
Raw material: Methane (natural gas).
Products: Ultrapure methane (99.99%), methyl chloride, methylene chloride, chloroform, and carbon tetrachloride.
Plant site: Solvay Process Division, Baton Rouge, La.
• Construction: Polyethers plant, with initial capacity of 20,000,000 lb. per year, scheduled for completion June 1961. Starting material will be propylene oxide.

ALOX CORP., Box 556, Niagara Falls, N. Y.
Plant: Niagara Falls.
Raw material: Petroleum fractions.
Products: Oxygenated petroleum chemicals for rust preventives, lube-oil additives, mixtures of organic acids, and other oxygenated hydrocarbons.

AMERICAN CHEMICAL CORP., 3211 E. 26 St., Los Angeles 23, Calif. (Richfield Oil Corp. and Stauffer Chemical Co.).
Plant: Long Beach, Calif.
Products: Ethyl chloride (40,000,000 lb. per year), ethylene dichloride, and vinyl chloride monomer (25,000,000 lb. per year). Ethylene dichloride primarily used as raw material for vinyl chloride monomer.

AMERICAN CYANAMID CO., 30 Rockefeller Plaza, New York 20, N. Y.
Plant: Fortier plant, Avondale, La.
Raw material: Natural gas.
Products: Hydrocyanic acid, acrylonitrile (100,000,000 lb. per year), acetylene (used internally), ammonia (150 tons per day), and ammonium sulfate.
Plant: Santa Rosa, Fla.
Product: 27,000,000 lb. per year of acrylic fiber.
Plant: Warners, N. J.
Raw material: Petroleum fractions.
Product: Oil-layer type of petroleum sulfonate (barium salt).

AMERICAN-MARIETTA CO., 3400 Thirteenth Ave., SW, Seattle 4, Wash.
Plant: Richmond, Calif., scheduled for completion September 1960.
Raw material: Phenol, formaldehyde, urea, and caustic.
Product: 30,000,000 lb. per year of synthetic resins.

AMERICAN OIL CO., 555 Fifth Ave., New York 17, N. Y.
Plant: El Dorado, Ark.
Raw material: Refinery streams.
Product: Polybutenes.
Plant: Texas City, Tex.
Raw material: Refinery streams.
Products: Benzene, nonene, heptene, and aromatic solvents.
Plant: Yorktown, Va.
Raw material: Refinery streams.
Products: Polybutenes and sulfur (50 tons per day).

AMERICAN RUBBER & CHEMICAL CO. (owned by American Synthetic Rubber Corp., Box 360, Louisville, Ky., and Stauffer Chemical Co.).
Plant site: Louisville.
• Construction: Plans call for facilities with initial capacity of 30,000 long tons per year of polyisoprene and polybutadiene. With modifications, this could be increased to 50,000 tons.

AMERICAN SYNTHETIC RUBBER CORP., Box 360, Louisville, Ky.
Plant: Louisville.
Product: 75,000 tons per year of SBR copolymer.

AMOCO CHEMICALS CORP., 910 S. Michigan Ave., Chicago 80, Ill.
Plant: Joliet, Ill.
Raw material: Petroleum aromatics.
Products: Phthalic anhydride, isophthalic acid, terephthalic acid, dimethyl terephthalate, dimethyl isophthalate, and benzoic acid.
• Construction: Semiworks for production of trimellitic anhydride scheduled for completion in 1961.
Plant: Texas City, Tex.
Raw material: Petroleum fractions and refinery gases.
Products: Benzene-2° (1,000 bbl. per day), toluene, xylenes, hydrocarbon resins (petroleum polymer and condensation resins), aromatic solvents, drying oils, alkylated naphthalenes, nonene, and methyl mercaptan.

APACHE POWDER CO., Benson, Ariz.
Plant: Curtiss, Ariz.
Raw material: Natural gas.
Products: Anhydrous ammonia (30 tons per day), nitric acid, ammonium nitrite, and sulfuric acid (80 tons per day).

ARMOUR AGRICULTURAL CHEMICAL CO., Nitrogen Division, Box 128, Crystal City, Mo.
Plant: Crystal City.
Raw material: Natural gas.
Products: Ammonia (200 tons per day), nitric acid (240 tons per day), ammonium nitrate (200 tons per day) and ammonia solutions.

ASHLAND OIL & REFINING CO., 1401 Winchester Ave., Ashland, Ky.
Plant site: Catlettsburg, Ky.
• Construction: New facilities, scheduled for completion in February 1961, will include capacity of 71,430 to 119,048 bbl. per year of benzene, and 75,000 lb. per year of naphthalene, from naphtha fraction.

ATLANTIC REFINING CO., 260 S. Broad St., Philadelphia 1, Pa.
Plant: Atreco, Tex.
Raw material: Petroleum fractions, refinery gases, and solvent extracts.
Products: Detergent alkylate (from benzene and propylene tetramer), and cresylic acid.
Plant: Philadelphia.
Raw material: Crude petroleum fractions, refinery gas, and solvent extracts.
Products: Aromatic solvents, diisobutylene, triisobutylene, technical eicosane, alkylbenzene, dodecylbenzene-sulfonic acid-type and water-soluble alkyl aryl sulfonates, sulfuric acid, and ammonia (165 tons per day).
Raw material: Asphalt.
Product: Thermoplastic resin.

ATLAS PROCESSING CO., Box 1786, Shreveport, La.
Plant: Shreveport.
Raw material: Field condensates and debutanized 400° F. end point naphtha from gas-processing plants.
Product: 600 bbl. daily of benzene.

AURORA GASOLINE CO., 15911 Wyoming Ave., Detroit 38, Mich.
Plant: Detroit.
Raw material: Naphtha fraction.
Product: 3,850 bbl. per day of mixed aromatics.
Raw material: Refinery gas.
Product: 27 long tons per day of sulfur.

AVISUN CORP. (Sun Oil Co. and American Viscose Corp.), 1608 Walnut St., Philadelphia 3, Pa.
Plant: Facilities leased from Koppers Co., Inc., at Port Reading N. J.
Raw material: Olefins.
Product: 20,000,000 lb. per year of polypropylene resins.
Plant site: New Castle, Del.
• Construction: AviSun plans to spend several million dollars to build a 100,000,000-lb. per year polypropylene resin plant.

BARNHART HYDROCARBON CORP., Drawer 633, Big Lake, Tex.
Plant: Barnhart field, Reagon County, Texas.
Product: Sulfur from natural gas (production 3 tons daily).

BORDEN CO., Chemical Division, 350 Madison Ave., New York 17, N. Y.
Plant: Fremont, near San Francisco, Calif.

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Raw material: Urea and methanol.
Products: Resin and formaldehyde. (Capacity of plant 90,000,000 lb. per year.)
Plant: Leominster, Mass.
Raw material: Vinyl chloride monomer.
Products: Polyvinyl alcohol, butadiene, and styrene. (Plant capacity is 12,000,000 lb. per year.)
Plant site: Illiopolis, Ill.
• Construction: Scheduled for completion by end of 1960 are facilities to produce 40,000,000 lb. per year of polyvinyl chloride from vinyl chloride monomer.

CABOT CARBON CO., Box 1101, Pampa, Tex.
Plants: Big Spring and Pampa, Tex., and Franklin and Ville Platte, La.
Raw material: Combined gas throughput of 48,000 M.c.f. per day and oil throughput of 6,000 bbl. per day.
Product: Carbon black (furnace process). Recent expansion at Big Spring, Franklin, and Ville Platte increased capacity by about 110,000,000 lb. per year.
Plants: Kermit and Skellytown, Tex.
Raw material: Combined throughput 60,000 M.c.f. per day.
Product: Carbon black (channel process).

CALCASIEU CHEMICAL CORP., operated by Petroleum Chemicals, Inc., Box 6, New Orleans 6, La.
Plant: Lake Charles, La.
Raw material: Ethylene.
Products: Ethylene glycol (8,000,000 gal. per year) and glycol sludge (775,000 gal. per year).

CALIFORNIA-SPRAY CHEMICAL CORP., Lucas and Ortho Way, Richmond, Calif. (subsidiary of Standard Oil Co. of California).
Plant: Kennewick, Wash.
Raw material: Ammonia.
Products: Ammonium nitrate (150 tons per day), complex pelletized fertilizers (250 tons per day), and fertilizer solutions.
Plant: Richmond, Calif.
Raw material: Natural and refinery gases and petroleum bases.
Products: Ammonia (300 tons per day), nitric acid (250 tons per day), ammonium sulfate, ammonium nitrate, fertilizer solutions, summer and winter oil sprays, aromatic solvents, spray detergents, and emulsifiers.
Plant site: Fort Madison, Iowa.
• Construction: Plans call for a 1,000-ton per day plant to produce complex pelleted fertilizers, ammonium nitrate, and anhydrous ammonia. Dates not announced yet.

CALLERY CHEMICAL CO., Box 1452, Muskogee, Okla.
Plant: Muskogee.
Raw material: Natural gas and boric acid.
Product is now undergoing a modification and will go into production of pentaborane for the Air Force by late summer.

CALUMET NITROGEN PRODUCTS CO., Box 5910-A, Chicago 80, Ill.
Plant: Hammond, Ind.
Raw material: Hydrogen-rich refinery gas.
Products: Anhydrous ammonia and solutions (300 tons per day).

CARBON BLACKS, INC., Box 236, Rayville, La.
Plant: Rayville.

Product: 120,000 lb. per year of high-grade color blacks only, using roller process.

CARIBE NITROGEN CORP. (W. R. Grace & Co., 7 Hanover Square, New York 5, N. Y.).
Plant: Guanica, Puerto Rico.
Products: Sulfuric acid and ammonium sulfate.

CARWIN COMPANY, Stiles Lane, New Haven, Conn.
Plant site: La Porte, Tex.
• Construction: Scheduled for completion fall 1960 are facilities to produce 1,000,000 lb. per year of isocyanates.

CARY CHEMICALS, INC., Box 1128, New Brunswick, N. J.
Plant: Flemington, N. J.
Raw material: Vinyl chloride.
Products: Polyvinyl chlorides and copolymers (50,000,000 lb. per year).

CELANESE CHEMICAL CO., Division of Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.
Plant: Bishop, Tex.
Raw material: Natural gas and liquefied petroleum gases (propane and butanes).
Products: Propylene oxide, propylene glycol, dipropylene glycol, 1,3-butylene glycol, 2,3-butylene glycol, acetone, methanol, formaldehyde, formaldehyde solutions in alcohols, paraformaldehyde, trioxane, acetaldehyde, acetic acid, n-propanol, isobutanol, n-butyl alcohol, special solvents, n-propyl acetate, pentaerythritol, butyraldehyde, 2-ethyl butanol, crotonaldehyde, and trimethylolpropane.
Plant: Houston, Tex.
Raw material: Ethylene and alpha olefins.
Product: 40,000,000 lb. per year of low-pressure polyolefins.
• Construction: Capacity is being expanded to 50,000,000 lb. per year.
Plant: Pampa, Tex.
Raw material: Natural gas, propane, and butanes.
Products: Propionic acid, methanol, acetone, acetic acid (240,000,000 lb. per year), acetic anhydride, vinyl acetate, n-propyl acetate, n-butyl acetate, butyric acid, methyl acetone, acetate methylal, methyl ethyl ketone, and ethyl acetate, and ethyl acrylate and methyl acrylate (13,000,000 lb. per year).
• Construction: Major expansion here will double capacity of higher acrylate esters when completed end of 1960. Facilities will have capacity of 14,000,000 lb. per year of 2-ethylhexyl, butyl acrylate, and glacial acrylic acid.
Plant: Point Pleasant, W. Va.
Raw material: Petroleum cresylic acid, phenol, propyl alcohol, ethylene oxide, butyl alcohol, isooctyl alcohol, and pentaerythritol.
Products: Tricresyl phosphate, dialkyl phosphate, polyester plasticizers, phenyl discresyl phosphate, chlorinated phosphates, pentaerythritolesters, and flame resistant hydraulic fluid.

CHEMSTRAND CORP., 350 Fifth Ave., New York 1, N. Y.
Plant: Pensacola, Fla.
Raw material: Petroleum-base stocks.
Product: Nylon.

CITIES SERVICE REFINING CORP., 716 Hodges St., Lake Charles, La.
Plant site: Lake Charles.
• Construction: Facilities to produce 120,000,000 lb. per year of ortho-xylene.

COLLIER CARBON & CHEMICAL CORP., Petroleum Building, 714 W. Olympic Blvd., Los Angeles 15, Calif.
Plant: Brea, Calif.
Raw material: Natural gas.
Products: Ammonia (320 tons per day), dry ice and liquid CO_2 (165 tons per day), ammonium nitrate, ammonium phosphate, and nitric acid.
Plants: Los Angeles, Santa Maria, and Oleum, Calif.
Raw material: Hydrogen sulfide.
Product: Molten sulfur.
Plants: Santa Clara, Contra Costa County, and Santa Maria, Calif.
Raw material: Petroleum coke.
Products: Industrial carbons, calcined carbon, and green petroleum coke.
Plant site: Los Angeles (harbor area).
• Construction: Facilities to produce 250 tons per day of sulfuric acid will be completed late 1960. Raw material will be hydrogen sulfide, sulfur, and spent alkylation acid.

COLTEXO CORP., 380 Madison Ave., New York.
Plant: Lefors, Tex. Throughput 32,000 M.c.f of gas per day.
Product: Carbon black (channel process).

COLUMBIA HYDROCARBON CORP., subsidiary of Columbia Gas System, Inc., 120 E. 41 St., New York 17, N. Y.
Plant site: Siloam, Ky.
• Construction: Ethlyene production facilities to be added to existing fractionation plant, which is fed by hydrocarbons from United Fuel Gas Co.'s Kenova, W. Va., extraction plant.

COLUMBIA-SOUTHERN CHEMICAL CORP. subsidiary of Pittsburgh Plate Glass Co., 1 Gateway Center, Pittsburgh 22, Pa.
Plant: Barberton, Ohio.
Raw material: Propane.
Products: Perchloroethylene and carbon tetrachloride.
Plant: Natrium, W. Va.
Raw material: Benzene.
Products: Monochlorobenzene, ortho-dichlorobenzene, paradichlorobenzene, and benzene hexachloride.
Plant: South Charleston, W. Va.
Raw material: Natural gas.
Product: Carbon bisulfide.
Plant: Lake Charles, La.
• Construction: A new plant to make ethylene dichloride was scheduled for completion in September 1960. The plant, costing more than $1,000,000, marks the company's entry into chemicals based on ethylene.

COLUMBIAN CARBON CO., 380 Madison Ave., New York 17, N. Y.
Plants: Eunice, N. M., and Coltexo, Seagraves, and Sweeny, Tex.
Product: Carbon black (channel process).
Plants: Conroe and Seagraves, Tex.; Eola and North Bend, La.; El Dorado, Ark.; and Hickok, Kans.
Product: Carbon black (furnace process).
Plants: Gray County, Texas (throughput of 12,000 M.c.f. daily), and another plant operated by the company's Peerless Carbon Black Division at Sweeny, Tex. (throughput of 5,000 M.c.f. per day).
Product: Carbon black (roller process).
Plant: Seminole field, Gaines County, Texas.
Product: Sulfur from natural gas (production 14 tons daily).
Plant site: Texas Gulf Coast (somewhere between Freeport and Orange).
• Construction: Plans call for a new $1-million carbon-black plant with capacity of 8,000,000 lb. per year.

COMMERCIAL SOLVENTS CORP., 260 Madison Ave., New York 16, N. Y.
Plant: Sterlington, La.
Raw material: Hydrogen and carbon monoxide.
Product: Methanol.
Raw material: Natural-gas fractions.
Products: Nitroethane, nitromethane, 1-nitropropane, 2-nitropropane, and nitrobutane.
Raw material: Natural gas.
Products: Ammonia (400 tons per day), ammonium nitrate, and nitrogen solutions.

CONTINENTAL CARBON CO., Southwest Division, 1400 W. 10 Ave., Amarillo, Tex.
Plants: Eunice, N. M.; Lake Charles, La. (70,000,000 lb. per year); Ponca City, Okla.; and Sunray, Tex.
Product: Carbon black (furnace process).
Plant site: Bakersfield, Calif.
• Construction: Work will start in 1960 on a new plant with capacity of 30,000,000 lb. per year of four different types of carbon blacks.

CONTINENTAL OIL CO., Box 2197, Houston 1, Tex.
Plant: Baltimore, Md.
Raw material: Propylene tetramer and benzene.
Products: Alkyl aryl sulfonating stocks including dodecylbenzene.
Plant: Chicago.
Raw material: Dodecylbenzene.
Products: Water-soluble surface-active sulfonates including liquid, slurried, drum-dried, and spray-dried stocks (dodecylbenzenesulfonic acid type) and oil-well fracturing compounds.
Plant: Gretna, La.
Raw material: Lube-oil stocks.
Products: White mineral oils, petroleums, and natural sulfonates.
Plant: Lake Charles, La.
Raw material: Naphtha fraction.
Products: Benzene (300 bbl. per day) and toluene-xylenes mix (1,600 bbl. per day).
Raw material: Propylene.
Product: Propylene tetramer.
• Construction: New facilities to produce 50,000 tons per year of straight-chain primary alcohols from ethylene will be completed in 1961.
Plant: Ponca City, Okla.
Raw material: Naphtha fraction.
Products: Benzene (350 bbl. per day) and toluene-xylenes mix (1,200 bbl. per day).
Raw material: Propylene.
Product: Propylene tetramer.
• Construction: Facilities to produce 65,000 tons per year of cyclohexane from benzene scheduled for completion in 1960.
Plant: Trainer, Pa.
Raw material: Alkyl aryl sulfonating feed stock.
Products: Oil-soluble surface-active sulfonates (lubricating-oil detergent additive and fuel-oil additives).

COOPERATIVE FARM CHEMICALS AS-

SOCIATION, Box 80, Lawrence, Kans.
Plant: Lawrence.
Raw material: Natural gas.
Products: Ammonia (280 tons per day), ammonium nitrate, nitrogen solutions, and urea nitrate solutions (100 tons per day).
• Construction: Scheduled for completion fall 1960 are facilities to increase ammonia production to 380 tons per day and urea facilities from present capacity of 30 tons of 100% urea daily to 50 tons.

COPOLYMER RUBBER & CHEMICAL CORP., Box 2591, Baton Rouge 1, La.
Plant: Baton Rouge.
Raw material: Petroleum derived.
Products: Butadiene (38,000 short tons per year) and copolymer (with total plant capacity of 73,500 long tons per year net or 95,000 long tons per year gross production).
• Construction: Expansion now under way to increase gross rubber production capacity to 127,000 long tons per year and net production capacity to 95,000 long tons per year. Completion set for early 1961. Butadiene capacity will be increased to 55,000 short tons per year by mid-1961 at cost of $5,000,000.

COSDEN PETROLEUM CORP., Box 1311, Big Spring, Tex. (subsidiary of W. R. Grace & Co.)
Plant: Big Spring.
Raw material: Naphtha fractions.
Products: Benzene (400 bbl. per day), toluene (400 bbl. per day), xylenes (800 bbl. per day), ortho xylene—99% purity (100 bbl. per day or 11,000,000 lb. per year), meta-xylene (80% purity), ethylbenzene, styrene monomer (20,000,000 lb. per year), and polystyrene (22,000,000 lb. per year).
Raw material: Mixed olefins.
Product: Polybutene (2,400,000 gal. per year).
• Construction: Plans call for new facilities to produce 3,000,000 lb. per year of meta-xylene (95% purity), using mixed xylenes as raw material. Completion scheduled January 1, 1961. Cosden also plans to boost styrene capacity to 60,000,000 lb. per year, and ortho-xylene capacity to 80,000,000 lb. per year, with completion scheduled late 1960.

CROWN CENTRAL PETROLEUM CORP., American Building, Baltimore, Md.
Plant: Pasadena, Tex.
Raw material: Refinery gas stream.
Product: Propane-propylene stream (sold to Shell Chemical Corp.).

JOHN DEERE CHEMICAL CO., Division of Deere & Co., Box 1417, Pryor, Okla.
Plant: Pryor.
Raw material: Natural gas.
Products: Ammonia (200 tons per day), urea (90,000 tons per year), and nitrogen solutions.

DELHI-TAYLOR OIL CORP., 823 Corrigan Tower, Dallas 1, Tex.
Plant: Corpus Christi, Tex.
Raw material: Selected petroleum fractions.
Products: Benzene (2,000 bbl. per day), toluene (800 bbl. per day), xylenes (700 bbl. per day), o-xylenes (220 bbl. per day), aliphatic solvents, and heavy aromatic solvents. (Capacity of extraction unit is 5,000 bbl. per day.)

DIAMOND ALKALI CO., Union Commerce Building, Cleveland 14, Ohio.
Plant: Belle, W. Va.
Product: Chlorinated methanes.
• Construction: Capacity will be increased by March 1961.
Plant: Deer Park, Pasadena, Tex.
Raw material: Ethylene.
Products: Perchlorethylene, vinyl chloride monomer (50,000,000 lb. per year), and polyvinyl chloride.
• Construction: Vinyl chloride polymer will be produced on completion of a new project February 1961. Also, new facilities for 40,000,000 lb. per year of acetylene from methane and oxygen will be completed in January 1962.
Plant: Painesville, Ohio.
Products: Chlorinated paraffins.
Plant: Greens Bayou, Pasadena, Tex.
Raw material: Benzene.
Products: Benzene hexachloride and DDT. (Projects by Diamond Alkali include production of C12 xylenes from p-xylenes on a semicommercial basis at the Greens Bayou plant.)

DIXON CHEMICAL INDUSTRIES, INC., 1260 Broad St., Bloomfield, N. J.
Plant: Paulsboro, N. J.
Raw material: Oil refinery sludge.
Product: 350,000 tons of sulfuric acid per year.

DOW BADISCHE CHEMICAL CO. (owned jointly by Badische Anilin- and Soda-Fabrik, AG, and Dow Chemical Co., Midland, Mich.).
Plant: Freeport, Tex.
Raw material: Acetylene.
Products: Acrylic acids and methyl, ethyl, butyl and other acrylic esters.
• Construction: Scheduled for completion in January 1962 are facilities to produce 40,000,000 lb. per year of caprolactam.

DOW CHEMICAL CO., Midland, Mich.
Plant: Allyn's Point, Conn.
Raw material: Styrene.
Products: Polystyrene and styrofoam.
• Construction: Facilities to produce latex from styrene and butadiene are scheduled for completion first quarter 1961.
Plant: Bay City, Mich.
Products: Ethylene, butadiene, and polyethylene.
Plant: Dow's Saginaw Bay Division at Bay City, Mich.
Raw material: Ethylene, butadiene, propylene.
Products: Linear polyethylene, polypropylene, and others.
Plant: Freeport, Tex.
Raw material: Natural gas, LPG, and benzene.
Products: Ethylene diamine; mono, di, tri, -ethanolamines; glycerin; ethylene and propylene oxides; ethylene, -propylene, -diethylene, -dipropylene, tetraethylene, -triethylene, -tripopylene glycols; carbon tetrachloride; chloroform; dichlorethyl, -dichloroisopropyl ether; styrene, ethyl benzene; ethyl, -methyl, -methylene chlorides; vinyl, -vinylidene chlorides; ethylene, -ethylidene, -propylene dichlorides; methyl chloroform; perchlorethylene; styrenebutadiene latex; polyethylene; trichloroethylene; allyl alcohol and allyl chloride; epichlorohydrin; and epoxy resins. Dow has combined capacity of 30,000 short tons per year of butadiene at the Freeport and Midland, Mich., plants.
• Construction: Combined styrene capacity will be expanded to 800,000,000 lb. per year at Freeport and Midland, Mich., plants, with completion reportedly expected late 1960 or early 1961. At Freeport, the polyglycol plant is being expanded, with completion early 1961.
Plant: Ironton, Ohio.
Raw material: Styrene.
Products: Polystyrene and styrofoam.
Plant site: Kalama, Wash.
• Construction: Phenol (36,000,000 lb. per year) will be produced from toluene at this new plant when completed third quarter 1961.
Plant: Midland, Mich.
Raw material: Crude oil, natural gas, and benzene.
Products: Ethylene; propylene; styrene; methyl styrene; ethyl benzene; ethyl chloride; ethylene dibromide; diethylbenzene; polystyrene; divinylbenzene; mono-, di-, -tri ethanolamines; i-propylbenzene (cumene); i-propyl chloride; propylene oxide; propylene dichloride; i-propanolamines; toluene-2°; polyglycols; glycol ethers; styrene-butadiene latex; polyvinyl chloride; vinyl-toluene; and vinylidene chloride polymer. The Midland and Freeport, Tex., plants have combined capacity of 30,000 short tons per year of butadiene.
• Construction: Combined styrene capacity will be expanded to 800,000,000 lb. per year at Midland and Freeport, Tex., plants, with completion reportedly expected late 1960 or early 1961.
Plant: Pevely, Mo.
Raw material: Styrene.
Products: Polystyrene and styrofoam.
Plant: Pittsburg, Calif.
Raw material: Natural gas, styrene, and butadiene.
Products: Methylene chloride, methyl chloride, chloroform, carbon tetrachloride, perchloroethylene, and styrene-butadiene latex.
Plant: Plaquemine, La.
Raw material: LPG.
Products: Ethylene, propylene, glycols, vinyl chloride, and other chlorinated hydrobarcons and related products.
• Construction: Facilities to produce polyethylene will be completed in October 1960. Facilities to produce vinylidene chloride and methyl chloroform scheduled for completion in 1961.
Plant: Torrance, Calif.
Raw materials: Styrene and propylene.
Products: Polystyrene and styrofoam.
• Construction: Polypropylene will be added in 1961.
Plant: Williamsburg, Va.
Product: Zefran acrylic fiber (12,000,000 lb. per year).
• Construction: Nylon 6 facilities (12,000,000 lb. per year) scheduled for completion late 1961.

DU PONT DE NEMOURS & CO., E.I., Wilmington 98, Del.
Plant: Antioch, Calif.
Raw material: Petroleum base stock.
Products: Tetraethyl lead and fluorinated hydrocarbons.
Plant: Beaumont, Tex.
Raw material: Ethylene.
Products: Chlorosulfonated polyethylene synthetic rubber and menthionine.

• Construction: Scheduled for completion by end of 1960 are facilities to produce 50,000,000 lb. per year of caprolactam based on cyclohexane. New facilities will also include manufacture of acrylonitrile from propylene, with completion in 1961.
Plant: Belle, W. Va.
Raw material: Natural gas.
Products: Urea (150,000 tons per year), nylon intermediates, and acrylics.
• Construction: To be completed early 1961 are facilities to produce methylamines.
Plant: Circleville, Ohio.
Raw material: Dimethyl terephthalate and ethylene glycol.
Product: Poylester film.
Plant site: Florence, S. C.
• Construction: New plant under way to double capacity of Du Pont's polyester film. Completion set for early 1961.
Plant: Gibbstown, N. J.
Raw material: Natural gas.
Product: Anhydrous ammonia.
Plant: La Porte, Tex.
Raw material: Methanol.
Products: Carbamate fungicides, methylamines, and dimethyl formamide.
Plant: Memphis, Tenn.
Raw material: Natural gas.
Products: Hydrogen cyanide, sodium cyanide, sodium, chlorine, and hydrogen peroxide.
Plant: Orange, Tex.
Raw material: Natural gas, propane, benzene, cyclohexane, and adiponitrile.
Products: Methanol, polyethylene, nylon intermediates, adipic acid, hexamethylene-diamine. Ethylene made from gas and/or propane is used to make linear polyethylene.
Plant: Parkersburg, W. Va.
Products: Acetal, fluorocarbon, acrylic, and nylon resins.
Plant: Victoria, Tex.
Raw material: Natural gas and butadiene.
Product: Adiponitrile (nylon salt basic).
• Construction: By late 1961 new facilities for production of high-pressure polyethylene from ethylene will be completed.

DX SUNRAY OIL CO., Box 381, Tulsa, Okla.
Plant: Duncan, Okla.
Raw material: Refinery gases.
Product: Propylene tetramer.
Plant site: Tulsa.
• Construction: Scheduled for completion fall 1960 is a Udex unit at the company's Tulsa refinery. Capacity will be 600 bbl. of benzene and 300 bbl. of toluene daily. Raw material will be crude-unit fractions.

EL PASO NATURAL GAS CO., Box 1161, El Paso, Tex.
Plant: Eunice, N. M.
Product: 30 tons per day of sulfur from refinery gas.

EL PASO NATURAL GAS CO., Box 1161, El Paso, Tex., and **REXALL DRUG & CHEMICAL CO.**
Plant site: Odessa, Tex.
• Construction: New facilities will handle 150,000,000 lb. per year of ethylene made from ethane and propane, and 120,000,000 lb. per year of high-pressure polyethylene from ethylene, with completion scheduled in January 1962. Facilities will also be built for production of propylene, linear polyethylene, and polypropylene.

ESCAMBIA CHEMICAL CORP., 261 Madison Ave., New York 16, N. Y.
Plant: Pensacola, Fla.
Raw material: Natural gas.
Products: Methanol (20,000,000 gal. per year), polyvinyl chloride (50,000,000 lb. per year), ammonia (200 tons per day), ammonium nitrate, and nitrogen fertilizer solutions.

ETHYL CORP., 100 Park Avenue Building at 41st St., New York 17, N. Y.
Plant: Baton Rouge, La.
Raw material: Ethane and ethylene.
Products: Tetraethyl lead, tetramethyl lead, ethyl chloride, ethylene dichloride, trimethyl phosphate, and vinyl chloride monomer.
Plant: Orangeburg, S. C.
Products: Ortho-alkylated antioxidants for petroleum products, rubber and plastics, aluminum alkyls, and alkyl aluminum halides.
Plant: Pasadena, Tex.
Raw material: Ethylene.
Products: Tetraethyl lead, ethyl chloride, and ethylene dichloride.
• Construction: Facilities to produce vinyl chloride monomer from ethylene will be ready early 1961.
Plant: Pittsburg, Calif.
Product: Tetraethyl lead.

ETHYL-DOW CHEMICAL CO., INC. (c/o Ethyl Corp., 100 Park Ave. Building at 41st St., New York 17, N. Y.)
Plant: Freeport, Tex.
Raw material: Ethylene.
Product: Ethylene dibromide.

FIRESTONE PLASTIC CO., Division of Firestone Tire & Rubber Co., Akron 17, Ohio.
Plant: Pottstown, Pa.
Raw material: Petroleum-base stocks.
Products: Polybutadiene-acrylonitrile (N-type) acrylic elastomers, polybutadiene-styrene type acrylic elastomers, and vinyl resins.
• Construction: Polyvinyl chloride resins facilities will be increased by early 1961.

FIRESTONE SYNTHETIC FIBERS CO., Division of Firestone Tire & Rubber Co., Akron 17, Ohio.
Plant: Hopewell, Va.
Product: Polypropylene.

FIRESTONE TIRE & RUBBER CO., Akron 17, Ohio, Synthetic Rubber & Latex Division.
Plant: Akron.
Product: 40,000 long tons per year of SBR copolymer.
• Construction: Capacity is being increased.
Plant: Lake Charles, La.
Product: 190,000 long tons per year of SBR copolymer.
Plant: Orange, Tex.
Product: 40,000 short tons per year of butadiene.
• Construction: Capacity is being increased by 30,000 tons per year. Facilities for polybutadiene and polyisoprene also will be completed early 1961.

FOOD MACHINERY & CHEMICAL CORP., 161 E. 42 St., New York 17, N. Y.
Plant: South Charleston, W. Va.
Raw material: Methane (natural gas).
Product: Carbon bisulfide.
Plant: Chemicals & Plastics Division, Nitro, W. Va.
Raw material: Petroleum cresylic acid.
Products: Tricresyl phosphate, plasticizers and diisooctyl phthalate and diallyl phthalate monomer from isooctyl, allyl, and other alcohols.

FOSTER GRANT CO., INC., 289 N. Main St., Leominster, Mass.
Plant: Baton Rouge, La.
Raw material: Benzene and ethylene.
Product: 145,000,000 lb. per year of styrene.
• Construction: To expand to 180,000,000 lb. per year in 1960.
Plant: Leominster, Mass.
Raw material: Styrene monomer.
Products: Polystyrene (15,000,000 lb. per year), styrene acrylonitrile molding powder (6,000,000 lb. per year), and molded articles.
Plant: Manchester, N. H.
Raw material: Caprolactam.
Product: Nylon 6 molding powder.
Plant site: Not announced, but probably Gulf Coast.
• Construction: New facilities for production of polyethylene will be completed in 1961. Construction to start in 1960.

FREEPORT SULPHUR CO., 161 E. 42 St., New York 17, N. Y.
Plant: Westville, N. J.
Product: 30 tons per day of sulfur from refinery gas.

FRONTIER OIL REFINING CO., (Division of Ashland Oil & Refining Co., 1401 Winchester Ave., Ashland, Ky.).
Plant: North Tonawanda, N. Y.
Raw material: Naphtha fraction.
Products: Benzene (300 bbl. per day) and toluene, xylenes, and heavy aromatics (1,500 bbl. per day).

GENERAL ANILINE & FILM CORP., 435 Hudson St., New York 14, N. Y.
Plant: Linden, N. J.
Raw material: Ethylene.
Products: Ethylene oxide (60,000,000 lb. per year) and ethylene glycol (35,000,000 lb. per year).

GENERAL RUBBER SYNTHETIC CORP. (General Tire & Rubber Co., 1708 Englewood Ave., Akron 9, Ohio.)
Plant: Odessa, Tex.
Raw material: Butadiene and styrene.
Product: 50,000 long tons per year of copolymer (cold SBR, oil extended; black master-batch and combinations).

GENERAL TIRE & RUBBER CO., 1708 Englewood Ave., Akron 9, Ohio.
Plant: Ashtabula, Ohio.
Raw material: Acetylene and HCl.
Product: Polyvinyl chloride.
Plant: Mogadore, Ohio.
Raw material: Butadiene, styrene, and other petroleum-derived materials.
Products: Butadiene-styrene latices, vinyl pyridene latex, styrene-acrylic latex, polyurethane elastomers, polyurethane prepolymers and activators.

GOODRICH CHEMICAL CO., B. F., 3135 Euclid Ave., Cleveland 15, Ohio.
Plant: Akron, Ohio.
Raw material: Petroleum-base stocks.
Product: Butadiene-acrylonitrile (N-type) rubber.
Plant: Avon Lake, Ohio.
Raw material: Alcohols and vinyl chloride.
Products: Plasticizers and polyvinyl chloride resins and compounds.

Plant: Calvert City, Ky.
Raw material: Petroleum-base stocks.
Products: Acrylonitrile, vinyl chloride, acrylic acid, and hydrogen cyanide.
Plant: Henry, Ill.
Products: Rubber chemicals.
Plant: Louisville, Ky.
Raw material: Petroleum-base stocks.
Products: Special rubbers including acrylonitrile-butadiene, carboxylic nitrile, butadiene-styrene. and polyacrylic rubber.
Plant: Watson, Calif.
Raw material: Vinyl chloride.
Product: Polyvinyl chloride resin.

GOODRICH-GULF CHEMICALS, INC., 3121 Euclid Ave., Cleveland 15, Ohio.
Plant: Institute, W. Va.
Product: 143,500 long tons per year of SBR copolymer.
• Construction: The company will build a new plant to make polyisoprene and/or polybutadiene either at Institute or in Orange County, Texas. Raw material will be isoprene and/or butadiene. Capacity will be 25,000 tons per year. Completion set for late 1961.
Plant: Port Neches, Tex.
Product: 129,000 long tons per year of SBR copolymer.
• Construction: Facilities for production of 13,000,000 lb. per year of polyethylene, with completion expected early 1961.

GOODYEAR TIRE & RUBBER CO., 1144 E. Market St., Akron, Ohio.
Plant: Akron.
Raw material: Petroleum-base stocks.
Products: SBR copolymer (27,500 long tons per year), butadiene acrylonitrile (N-type) elastomers, high-styrene type latices, and vinyl chloride polymers.
Plant: Houston, Tex.
Product: 245,000 long tons per year of SBR copolymer.
Plant site: Beaumont, Tex.
• Construction: New facilities for production of polyisoprene and polybutadiene will be completed spring 1961.

GRACE & CO., W. R., 7 Hanover Square, New York 5, N. Y.
Plant: Dewey & Almy Division, Box 61, Owensboro, Ky.
Products: Styrene-butadiene latices, polyvinyl acetate, and battery separators.
Plant: Nitrogen Products Division, Box 4915, Memphis, Tenn.
Raw material: Natural gas.
Products: Ammonia (100,000 tons per year) and urea (100,000 tons per year).
• Construction: Ammonia capacity is being increased by 60,000 tons per year, with completion set for first quarter 1961.
Plant: Polymer Chemicals Division, Box 3006, Baton Rouge 5, La.
Raw material: Ethylene.
Product: Polyolefins.

GREAT NORTHERN OIL CO., Box 3596, St. Paul 1, Minn.
Plant: Pine Bend, Minn.
Product: 60 tons per day of sulfur from refinery gas.

GREAT SOUTHERN CHEMICAL CORP., Box 4166, Corpus Christi, Tex.
Plant: Corpus Christi.
Raw material: Naphtha fractions.
Products: Benzene, toluene, xylene, and solvent naphtha.

GREAT WESTERN PRODUCERS, INC., Petrochemical Division, 200 N. Wildwood Road, Irving, Tex.
Plant: Irving.
Raw material: Distillate and crude oil.
Products: Aromatic solvents, aliphatic solvents, gasolines, and diesel fuels.

GULF OIL CORP., Gulf Building, Pittsburgh 30, Pa.
Plant: Cleves (Cincinnati), Ohio.
Product: Heptenes from refinery gas.
Plant: Philadelphia, Pa.
Raw material: Heptenes, nonenes, and refinery gases.
Products: Decyl alcohol, isooctyl alcohol, propylene, and sulfur.
• Construction: New oxo alcohols plant now under way and scheduled for completion early 1961 (capacity 35,000,000 to 40,000,000 lb. per year). Additional facilities to produce oxo derivatives to follow.
Plant: Port Arthur, Tex.
Raw material: Benzene (30,000,000 lb. per year), butane, heptenes, propane, refinery gases, and refinery streams.
Products: Aromatic distillate, benzene, butylenes, cyclohexane, ethylene, isooctyl alcohol, propylene, propylene tetramer, propylene trimer, sulfur, and toluene.
Plant: Waddell, Tex.
Product: Sulfur from natural gas.

HANCOCK CHEMICAL CO. (Signal Oil & Gas Co., 811 W. 7th St., Los Angeles, Calif.).
Plant: Watson, Calif.
Product: 200 tons per day of sulfur from refinery gas.

HERCULES POWDER CO., Wilmington 99, Del.
Plant: Burlington, N. J.
Raw material: Para-xylene, methanol.
Product: 12,000,000 lb. per year of dimethylterephthalate.
• Construction: Capacity to be increased to 36,000,000 lb. per year by October 1960.
Plant: Gibbstown, N. J.
Raw material: Propylene and benzene.
Products: Phenol, acetone, cumene, cumene hydroperoxide, acetophenone, and a-methylstyrene.
Plant: Hercules, Calif.
Raw material: Natural gas.
Products: Ammonia (150 tons per day), urea nitrate (20,000 tons per year), and nitrogen tetraoxide (10,000 tons per year).
• Construction: New facilities will include capacities of 50,000,000 lb. per year of formaldehyde, 8,000,000 gal. per year of methanol, and 11,000 tons per year of urea-formaldehyde compositions.
Plant: Louisiana, Mo.
Raw material: Natural gas.
Products: Ammonia (115 tons per day), methanol (70 tons per day), formaldehyde (100,000,000 lb. per year), and pentaerythritol (24,000,000 lb. per year).
Plant: Parlin, N. J.
Raw material: Ethylene.
Product: 30,000,000 lb. per year of polyethylene.
Raw material: Propylene.
Product: 20,000,000 lb. per year of polypropylene.
Plant site: Lake Charles, La.
• Construction: New plant here will have capacity of 100,000,000 lb. per year of polypropylene, with the first 50,000,000-lb. unit ready early 1961.

HEYDEN NEWPORT CHEMICAL CORP., Heyden Chemical Division, 342 Madison Ave., New York 17, N. Y.
Plant site: Fords, N. J.
• Construction: Scheduled for completion spring 1961 are facilities to produce 24,000,000 lb. per year of maleic anhydride from benzene.

HOOKER CHEMICAL CORP., Eastern Chemical Division, Box 344, Niagara Falls, N. Y.
Plant: Niagara Falls.
Raw material: Pentane, petroleum waxes, benzene, toluene, xylene, ethyl alcohol, and isopropyl ether.
Products: Chlorinated waxes, hexachlorocyclopentadiene, phenol, chlorobenzenes, phenolic resins and molding compounds, benzene hexachloride, benzoyl chloride, benzyl chloride, monochlorotoluene, benzoic acid, and sodium benzoate.
Plant site: South Shore, Ky.
• Construction: New facilities to produce phenol from benzene will be completed end of 1961.

HOUSTON CHEMICAL CORP., Box 19544, Houston 24, Tex. (subsidiary of Chatham-Reading Chemical Corp.).
Plant site: Beaumont, Tex.
• Construction: New facilities for production of tetraethyl and tetramethyl lead, ethylene oxide and derivatives will be completed by mid-1962.

HUBER CORP., J. M., Box 831, Borger, Tex.
Plant: Baytown, Tex.
Product: 110 tons per day of carbon black (furnace process).
• Construction: This will be increased by 83 tons per day by January 1, 1961, at cost of $2,500,000. Residual oil will be raw material.
Plant: Borger, Tex.
Products: 120 tons per day of carbon black (furnace process) and 74 tons per day of carbon black (channel process).

HUMBLE OIL & REFINING CO., ESSO STANDARD DIVISION, 15 W. 51st St., New York 19, N. Y.
Plant: Baton Rouge, La.
Raw material: Natural gas, refinery gas streams, and liquid fractions.
Products: Butyl rubber (60,000 long tons per year), butadiene (55,000 short tons per year), aromatic distillates and solvelts (600 bbl. per day of benzene), aromatic tars, ethane, ethylene, propylene, normal butylene, isobutylene, isoprene, nonene, tetrapropylene, ethanol, isopropanol, hexanol, isooctanol, decanol, tridecanol, ethyl ether, isopropyl ether, dicyclopentadiene, benzene, petroleum resins, polyisobutylene, hydrogen, oxo alcohols (90,000,000 lb. per year), buton resins for surface coatings (butadiene-styrene copolymer), chlorinated butyl rubber, butyl latex, and brominated butyl rubber.
• Construction: Butyl rubber capacity will be increased by 18,000 long tons per year when expansion is completed second quarter 1961.
Plant: Bayonne, N. J.
Raw material: Liquid fractions.
Products: Additives for crankcase lubes, automotive transmission fluids, industrial oils, gasoline, and fuel oils; naphthenic acids.
Plant: Linden, N. J.

Raw material: Refinery gas streams and liquid fractions.
Products: Ethylene, isobutylene, polyisobutylenes, secondary butanol, methyl ethyl ketone, lube oil additives, nonene, tripropylene, tetrapropylene, acetone, detergent inhibitor and antiwear additives.

HUMBLE OIL & REFINING CO., HUMBLE DIVISION, Box 2180, Houston 1, Tex.
Plant: Baytown, Tex.
Raw material: Refinery streams.
Products: Polypropylene (40,000,000 lb. per year), butyl rubber (57,500 long tons per year), butadiene (65,000 short tons per year), benzene (2,500 bbl. per day), toluene (5,000 bbl. per day), solvent xylene (5,500 bbl.), para-xylene (600 bbl.), ortho-xylene, high boiling range aromatic solvents, ethylene, propylene, normal butylenes, isobutylene, pentylene concentrate, heptene, nonene, tetrapropylene, narrow boiling range aliphatic naphthas (hexane, heptane, and octane), cyclohexane, special naphthas, aromatic quench oil, and carbon-black feed stock.
• Construction: Butyl rubber capacity will be increased by 19,500 long tons per year when expansion is completed in second quarter 1961. Plans also call for expansion of ortho-xylene capacity from 44,000,000 to 72,000,000 lb. per year by the end of 1960.

JEFFERSON CHEMICAL CO., INC., 1121 Walker Ave., Houston 2, Tex.
Plant: Conroe, Tex.
Products: Morpholine, urethane intermediates, and specialty surface-active agents.
Plant: Port Neches, Tex.
Raw material: Refinery gases (ethane, propane streams) and other raw materials.
Products: Ethylene (260,000,000 lb. per year), ethylene oxide (165,000,000 lb. per year), ethylene glycol (126,000,000 lb. per year), ethylene dichloride, propylene oxide, propylene and dipropylene glycol, piperazine, ethylene oxide-tridecyl alcohol condensates, diethylene and triethylene glycols, polyethylene glycols, ethanolamines, ethylene carbonate, propylene carbonate, morpholine, nonyl phenol, and ethylene oxide-nonyl phenol condensates.

JEFFERSON LAKE SULPHUR CO., 1408 Whitney Building, New Orleans 12, La.
Plant: Houston.
Raw material: Refinery treating wastes.
Products: Phenol, cresols, cresylic acid (200,000 gal. per month), and sodium sulfide.
Plant: Manderson, Wyo.
Product: 50 tons of sulfur per day from natural gas.

KENDALL REFINING C., Bradford, Pa.
Plant: Bradford.
Raw material: Petroleum fractions.
Products: Heavy hydrocarbons (petroleum polymer and condensation resins).

KOPPERS CO., INC., Plastic Division, Pittsburgh 19, Pa.
Plant: Kobuta, Pa.
Raw material: Ethylbenzene.
Products: Styrene and expandable polystyrene beads.
• Construction: Expansion program, now in progress, will increase capacity of polystyrene products about 15% by late 1960.
Plant: Port Arthur, Tex.
Raw material: Ethylene.
Products: Ethylbenzene and polyethylene.
• Construction: New facilities under way will increase capacity of high-pressure polyethylene by 35% to 46,000,000 lb. per year. Completion expected late 1960.
Plant: Woodridge Township, N. J.
Raw material: Ethylene.
Products: Low-pressure polyethylene. (Normal capacity is 30,000,000 lb. per year, but part of plant is now being used for production of polypropylene.)

LEONARD REFINERIES, INC., East Superior St., Alma, Mich.
Plant: Roosevelt Division, Mount Pleasant, Mich.
Raw material: Naphtha fraction.
Products: Benzene (250 bbl. per day), toluene (250 bbl. per day), and xylene concentrates (30 bbl. per day).

LUBRIZOL CORP., Box 3057, Cleveland 17, Ohio.
Plant: Cleveland.
Raw material: Petroleum fractions.
Products: Lube-oil additives.
Plant: Pasadena, Tex.
Raw material: Petroleum fractions.
Products: Lube-oil additives.

MARBON CHEMICAL, Division of Borg-Warner Corp., Box 68, Washington, W. Va.
Plant: Gary, Ind.
Raw material: Acrylonitrile, butadiene, and styrene.
Products: High-styrene resins and high-impact thermoplastic molding material.
Plant: Parkersburg, W. Va.
Raw material: Styrene, acrylonitrile, and butadiene.
Products: High-impact thermoplastic resins.

MISSISSIPPI CHEMICAL CORP., Highway 49 E, Yazoo City, Miss.
Plant: Yazoo City.
Raw material: Natural gas.
Products: Ammonia (325 tons per day), ammonium nitrate (500 tons per day), nitric acid (480 tons per day), and urea (100 tons per day).

MOBIL CHEMICAL CO., 150 E. 42nd St., New York 17, N. Y.
Plant: Beaumont, Tex.
Raw material: Petroleum fractions.
Products: Cresylic acid and sodium cresylate solutions.
• Construction: Scheduled for completion first quarter 1961 are new facilities for production of 380,000,000 lb. per year of ethylene, 100,000,000 lb. per year of propylene, and 20,000,000 lb. per year of butadiene. Cost of project is about $25 million.

MOBIL OIL CO., 150 E. 42 St., New York 17, N. Y.
Plant: Augusta, Kans.
Raw material: Petroleum fractions.
Products: Select aromatic oils.
Plant: Brooklyn N. Y.
Raw material: Petroleum fractions.
Products: Sodium cresylate solutions.
Plant: Buffalo, N. Y.
Raw material: Petroleum fractions.
Products: Sodium sulfide solutions and sodium cresylate solutions.
Plant: Casper, Wyo.
Raw material: Petroleum fractions.
Products: Select aromatic oils.
Plant: East Chicago, Ind.
Raw material: Refinery streams.
Products: Sodium cresylate solutions and hydrogen.
Plant: East St. Louis, Ill.
Raw material: Refinery streams.
Products: Sodium cresylate solutions.
Plant: Ferndale, Wash.
Raw material: Refinery streams.
Products: Sodium sulfide sludge.
Plant: Paulsboro, N. J.
Raw material: Petroleum fractions.
Products: Sodium cresylate solutions, sodium sulfide solutions, propylene, and sulfur (100 short tons per day).
Plant: Torrance, Calif.
Raw material: Refinery streams.
Products: Sodium cresylate sludge, hydrogen sulfide (in commercial amine solution), ammonium sulfate, and crude naphthenic acids. (Latter are processed into highly refined naphthenic acids and metallic naphthenates at the Vernon process products plant at Los Angeles.)

MONOCHEM, INC. (jointly owned by Borden Co. and U. S. Rubber Co.).
Plant site: To be selected somewhere between Corpus Christi, Tex., and New Orleans.
• Construction: New plant to produce 80,000,000 lb. of acetylene and 150,000,000 lb. of vinyl chloride monomer yearly, with completion in 1962. Borden and U. S. Rubber each will then erect its own plants to use Monochem's output.

MONSANTO CHEMICAL CO., 800 N. Lindbergh Boulevard, St. Louis, Mo.
Plant: Avon, Calif., operated by Monsanto's Organic Chemicals Division.
Raw material: Benzene.
Product: Phenol (by sulfonation).
Plant: El Dorado, Ark., operated by Monsanto's Inorganic Chemicals Division.
Raw material: Natural gas.
Products: Ammonia (585 tons per day), ammonium nitrate, ammonium sulfate, nitrogen solutions, aqua ammonia, and urea (100 tons per day).
Plant: El Dorado, Ark., operated by Monsanto's Lion Oil Co. Division.
Raw material: Refinery streams.
Product: 340 bbl. per day of propylene tetramer.
Raw material: Natural gas.
Product: 15 tons per day of sulfur. (This unit was formerly at Magnolia, Ark., but was dismantled and reassembled at El Dorado.)
Plant: Luling, La., operated by Monsanto's Inorganic Chemicals Division.
Raw material: Natural gas.
Products: Ammonia (400 tons per day), ammonium nitrate, solid (dry ice) and liquid CO_2 (42 tons per day), and nitrogen solutions.
Plant: Luling, La., operated by Monsanto's Organic Chemicals Division.
Raw material: Petroleum-derived fractions.
Product: Adipic acid.
Plant: Texas City, operated by Monsanto's Lion Oil Co. Division.
Raw material: Natural gas, propane, and butane.
Products: Ethylene and propylene.
Plant: Texas City, operated by Monsanto's Plastics Division.

Raw material: Natural gas, propane, and benzene.
Products: Ethylbenzene, styrene monomer (360,000,000 lb. per year), ethylene dichloride, vinyl chloride, acrylonitrile (100,000,000 lb. per year), hydrogen cyanide, toluene-2°, tertiary-butylamine. (Acetylene and ethylene manufactured here are used internally.)
Raw material: Ethylene.
Product: 100,000,000 lb. per year of polyethylene.
Plant site: Somewhere in Texas, possibly in Brazoria County.
• Construction: Monsanto in late 1959 announced plans to build facilities to produce 200,000,000 lb. per year of styrene monomer, with the first stage expected to be in operation by first quarter 1961.

MONSANTO CHEMICAL CO. (see above address) and **HEYDEN CHEMICAL CORP.**, 342 Madison Ave., New York.
Plant: Texas City.
Raw material: Byproduct hydrogen and carbon monoxide from acetylene synthesis.
Product: Methanol.

MONSANTO CHEMICAL CO. (see above address) and **TIDEWATER OIL CO.**, 4201 Wilshire Blvd., Los Angeles 5, Calif.
Plant: Avon, Calif.
Raw material: Hydrogen sulfide and spent alkylation acid from Tidewater refinery.
Product: 340 tons per day of sulfuric acid.

MONTANA SULPHUR & CHEMICAL CO., Box 1084, Billings, Mont.
Plant: Billings.
Product: 40 tons per day of sulfur from refinery gas.

MONTROSE CHEMICAL CO., 104-12 Lister Ave., Newark 5, N. J.
Plant: Newark.
Raw material: Petroleum cresylic acid.
Products: Tricresyl phosphate and diphenyl monocresyl phosphate.
• Construction: New facilities for production of 4,000,000 lb. per year of dimethyl isophthalate set for completion in 1960. Raw material will be isophthalic acid.

NATURAL GAS ODORIZING, INC., Box 15252, Houston, Tex.
Plant: Houston.
Raw material: Crude mercaptans (ethyl and higher).
Products: Odorants for natural gas and LPG.

NAUGATUCK CHEMICAL, Division of U. S. Rubber Co., Elm St., Naugatuck, Conn.
Plant: Baton Rouge, La.
Raw material: Styrene, butadiene, and acrylonitrile.
Products: N-type rubber, styrene copolymers and latices, as ABS polymers.
Plant: Naugatuck.
Raw material: Styrene and butadiene.
Product: 30,000 long tons per year of SBR copolymer.

NECHES BUTANE PRODUCTS CO. (Goodrich-Gulf Chemicals Co. and Texas-U. S. Chemical Co.).
Plant: Port Neches, Tex.
Product: 295,000 short tons per year of butadiene.

NEVILLE CHEMICAL CO., Neville Island, Pittsburgh 25, Pa.
Plant: Anaheim, Calif.
Raw material: Unsaturated petroleum fractions.
Products: Aromatic petroleum solvents, heat-reactive resins, and thermoplastic resins.
Plant: Neville Island, Pa.
Raw material: Unsaturated petroleum fractions.
Products: Aromatic petroleum solvents, heat-reactive resins, and thermoplastic resins.

NOPCO CHEMICAL CO., Griffin Chemical Division, 1141 S. 14 St., Richmond, Calif.
Plant: Richmond.
Raw material: Petroleum fractions.
Products: Naphthenic acid and petroleum sulfonates (emulsifying agents).

NORTHERN CHEMICALS INDUSTRIES, Totman Building, 210 East Redwood St., Baltimore 2, Md.
Plant: Searsport, Me.
Raw material: Bunker C fuel oil.
Products: Ammonia (125 tons per day) and nitrogen solutions.

NORTHWEST PETROCHEMICAL CORP., Anacortes, Wash.
Plant: Anacortes.
Raw material: Spent caustic from oil refineries.
Products: Refined cresols, phenol, and xylenol.

NOVAMONT CORP. (subsidiary of Montecatini, c/o Chemore Corp., 2 Broadway, New York 4, N. Y.).
Plant site: Neal, W. Va.
• Construction: Scheduled for completion by July 1, 1961, is a $10,000,000 plant with capacity of 25,000,000 lb. per year of polypropylene and other polyolefins.

ODESSA BUTADIENE CO. (owned by El Paso Natural Gas Products Co., Box 1161, El Paso, Tex.).
Plant: Odessa, Tex.
Product: 50,000 short tons per year of butadiene.

ODESSA STYRENE CO. (owned by El Paso Natural Gas Products Co., Box 1161, El Paso, Tex., and United Carbon Co.).
Plant: Odessa, Tex.
Raw material: Propane and benzene.
Product: 60,000,000 lb. per year of styrene.
• Construction: Styrene capacity will be expanded to 85,000,000 lb. per year in 1960.

OLIN-MATHIESON CHEMICAL CORP., 460 Park Ave., New York 22, N. Y.
Plant: Brandenburg, Ky.
Raw material: Ethane and propane.
Products: Ethylene oxide, propylene oxide; ethylene, diethylene, triethylene, propylene and dipropylene glycols; polyethylene glycols; polypropylene glycols; propoxylated glycerine; ethylene dichloride; propylene dichloride; ethylene glycol ethers; ethylene glycol ether esters; ethanolamines; dichloroethyl ether; aromatic distillates and solvents; ethylene chlorohydrin; nonionic surface active agents (polyoxyethylene ether alcohols); polyamides; and pour-point depressants and v.i. improvers for lube oil.
Plant: Lake Charles, La.
Raw material: Natural gas.
Products: Ammonia (250 tons per day) and hydrazine.
Plant: McKamie, Ark.
Product: 100 tons per day of sulfur from natural gas.

ORONITE CHEMICAL CO. (subsidiary of Standard Oil Co. of California), 200 Bush St., San Francisco 20, Calif.
Plant: Anaheim, Calif.
Raw material: Dibasic acids and solvents.
Products: Alkyd and polyester resins.
Plant: Oak Point, La.
Raw material: Petroleum base stocks.
Products: Lube-oil additives, furnace-oil additive, gas odorants, nonionic detergents, algicides, alkyl phenols, grease additive, and diesel-fuel additive.
Plant: Richmond, Calif.
• Construction: Oronite will double capacity for polybutene at Richmond (see Standard Oil Co. of California listing).

PAN AMERICAN PETROLEUM CORP., Box 591, Tulsa, Okla.
Plant: Elk Basin field, Wyoming.
Product: 76 tons per day of sulfur from natural gas.
Plant: Empire Abo field, Eddy County, New Mexico.
Product: 12½ tons per day of sulfur from natural gas.
Plant: Midland Farms field, Andrews County, Texas.
Product: 11 tons per day of sulfur from natural gas.
Plant: North Cowden field near Odessa, Tex.
Product: 15 tons per day of sulfur from natural gas.
Plant: Slaughter field near Sundown, Tex.
Product: 38 tons per day of sulfur from natural gas.

PANTASOTE CO., 415 Madison Ave., New York.
Plant: Passaic, N. J.
• Construction: This company is reportedly tripling capacity of polyvinyl chloride facilities to 45,000,000 lb. per year, with completion in 1960.

PARKER, J. L., 302 Wright Building, Tulsa 3, Okla.
Plant: Andrews, Tex.
Product: 15 tons per day of sulfur from natural gas.
Plant: Madill, Okla.
Product: 15 tons per day of sulfur from natural gas.
Plant: Penwell, Tex.
Product: 30 tons per day of sulfur from natural gas.

PENNSALT CHEMICALS CORP., Three Penn Center, Philadelphia 2, Pa.
Plant: Houston, Tex.
Raw materials: Natural gas, butane, methyl alcohol, ethyl alcohol, sulfur, and various olefins.
Products: Methyl mercaptan, ethyl mercaptan, thiophene, butyl mercaptan, tetrahydrothiophene, octyl mercaptan, tertiary butyl mercaptan, tertiary nonyl mercaptan, and tertiary dodecyl mercaptan.
• Construction: Scheduled for completion early 1961 are facilities to produce alkyl mercaptan from petroleum naphthas. Project will cost about $750,000.
Plant: Wyandotte, Mich.
Raw material: Pentane, pentane fractions, and triisobutylene.

Products: Amyl alcohol, amyl chloride, amyl acetate, amyl phenols, amyl naphthalenes, n-alkyl mercaptans, tertiary dodecyl mercaptan, polyethylene glycol tert-dodecyl thioether, 2-pentene, mixed pentenes, thiophene, tetene, tetra hydrothiophene, and carbon disulfide.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP., Clairton, Pa.
Plant: Chester, Pa.
Raw material: Petroleum base stocks.
Products: Petroleum polymer and condensation resins.
Plant: West Elizabeth, Pa.
Products: Hydrocarbon resins and aromatics.

PENNSYLVANIA REFINING CO., Butler, Pa.
Plant: Karns City, Pa.
Raw material: Crude oil, finished and semifinished lube oil, distillates, and waxes.
Products: Petroleum sulfonates.

PETROCHEMICALS CO., DIVISION OF UNIVERSAL DETERGENTS, INC., 1825 E. Spring St., Long Beach 6, Calif.
Plant: Long Beach.
Raw material: Petroleum fractions.
Products: Alkyl naphthalene sulfonates, aromatic solvents, and alkyl naphthalene sulfonate with insignificant foam.

PETROLEUM CHEMICALS, INC. (Cities Service Co. and Continental Oil Co.), 821 Gravier St., Box 6, New Orleans 6, La.
Plant: Lake Charles, La.
Raw material: Petroleum feed stocks.
Products: Ethylene (300,000,000 lb. per year), propylene (40,000,000 lb.), aromatic distillate (500,000 lb.), butadiene (110,000 short tons per year), ammonia (100,000 tons per year), and oxygen (90 tons per day).

PETRO-TEX CHEMICAL CORP., Box 2584, Houston, Tex.
Plant: Houston.
Raw material: Petroleum base stock.
Products: Butene-1, butene-2, diisobutylene, triisobutylene, isobutylene (2,000,000 gal. per year), butadiene (200,000 short tons per year), and aviation alkylate.
• Construction: Completed by late 1960 will be a full-scale pilot plant for polybutene-1. Scheduled for completion mid-1961 are facilities for maleic anhydride (30,000,000 lb. per year), using C_4 hydrocarbons as raw material.

PHILLIPS CHEMICAL CO., Bartlesville, Okla.
Plant: Big Spring, Tex. (operated by Cosden Petroleum Corp.).
Raw material: Mixed xylene.
Product: 5,300,000 lb. per year of paraxylene.
Plant: Borger, Tex.
Raw material: Gas oil.
Product: 290,000,000 lb. per year of carbon blacks, using furnace process.
Raw material: Butane.
Products: Butadiene (112,000 short tons per year), butene-1, and butene-2.
Raw material: Butadiene and styrene.
Product: 108,000 long tons per year of SBR copolymer.
• Construction: New facilities for production of 25,000 long tons per year of Cis-4 polybutadiene rubber will be completed fourth quarter 1960.
Plant: Etter, Tex. (Part of the facilities are government leased, with a portion owned by Phillips Chemical.)
Raw material: Natural gas.
Products: Anhydrous ammonia (191,600 short tons per year), nitric acid (130,000 short tons per year), ammonium nitrate (142,000 short tons per year), and nitrogen solutions (55,000 short tons per year).
Plants: Goldsmith and Crane, Tex. (operated by Phillips Petroleum Co.).
Product: 87,600 long tons per year of sulfur from H_2S.
Plant: Pasadena, Tex.
Raw material: Methylethylpyridine.
Product: 5,400,000 lb. per year of methylvinylpyridine.
Raw material: Natural gas.
Product: 191,600 short tons per year of anhydrous ammonia.
Raw material: Ammonia and sulfuric acid.
Product: 401,500 short tons per year of ammonium sulfate.
Raw material: Ethylene.
Product: 75,000,000 lb. per year of polyethylene.
Plant: Phillips, Tex.
Raw material: Petroleum fractions.
Products: Tert-butyl mercaptan, tert-dodecyl mercaptan, other sulfur chemicals, n-butyl mercaptan, other chemical specialties, n-propyl mercaptan, high-purity hydrocarbons, and polybutadiene rubber.
Plant: Sweeny, Tex.
Raw material: Butane and/or propane.
Products: Ethylene (290,000,000 lb. per year), propylene, and butadiene concentrate.
• Construction: Ethylene capacity is being expanded to 510,000,000 lb. per year.
Plant site: Orange Tex.
• Construction: A new plant with capacity of 60,000,000 lb. per year of carbon black from gas oil will be completed fourth quarter 1960.

PHILLIPS PACIFIC CHEMICAL CO. (owned by El Paso Natural Gas Co. and Phillips Petroleum Co., Bartlesville, Okla. Operator of the plant is Phillips Chemical Co.).
Plant: Kennewick, Wash.
Raw material: Natural gas.
Product: 73,000 short tons per year of anhydrous ammonia.

PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Plant: Kansas City, Kans.
Raw material: Petroleum fractions.
Products: Rubber extender and process oils.
Plant: Phillips, Tex.
Raw material: Petroleum fractions.
Products: Di-isopropyl, cyclohexane, n-pentene, hydrogen sulfide, ethyl mercaptan, reference fuels for knock engines, and solvents.
Plant: Sweeny, Tex.
Raw material: Petroleum fractions.
Products: Cyclohexane and benzene concentrate.

PITTSBURGH CHEMICAL CO., Grant Building, Pittsburgh 19, Pa. (a subsidiary of Pittsburgh Coke & Chemical Co.).
Plant site: Neville Island (Pittsburgh).
• Construction: Scheduled for completion first quarter 1961 are facilities to produce 20,000,000 lb. per year of maleic anhydride from benzene.

PRODUCTOL CO., 417 S. Hill St., Los Angeles 13, Calif.
Plant: Santa Fe Springs, Calif.
Raw material: Refinery byproduct fractions.
Products: Phenols, cresols, cresylic acids, and xylenols.

PURE OIL CO., 35 E. Wacker Drive, Chicago.
Plant: Lemont, Ill.
Raw material: Petroleum fractions.
Products: Solvents.
Raw material: Refinery gas.
Product: 20 tons per day of sulfur.
Plant: Smiths Bluff, Tex.
Raw material: Petroleum fractions and refinery-gas streams.
Products: Petroleum polymer, condensation resins, solvents, nonparaffin concentrates, 1-butene, 2-butene, and mixtures.
Plant: Toledo, Ohio.
Raw material: Petroleum fractions.
Products: Solvents.

REICHHOLD CHEMICALS, INC., RCI Building, White Plains, N. Y.
Plant: Azusa, Calif.
Raw material: Formaldehyde, USP phenol, petroleum solvents, and styrene.
Products: Phenol-formaldehyde resins, alkyd resin solutions, and polyester resins.
Plant: Ballardvale, Mass.
Raw material: Formaldehyde, USP phenol, methanol (from natural gas), bisphenol, acetone, and epichlorhydrin.
Products: Phenol-formaldehyde resins, urea-formaldehyde resins, formaldehyde, and epoxy resins (10,000,000 lb. per year of liquid and solid epoxies).
Plant: Charlotte, N. C.
Raw material: Methanol (from natural gas), formaldehyde, and vinyl acetate monomer.
Products: Formaldehyde, urea-formaldehyde resins, and polyvinyl acetate emulsions.
Plant: Detroit, Mich.
Raw material: Formaldehyde, USP phenol, styrene, petroleum solvents, glycerin (synthetic), and normal butyl alcohol.
Products: Phenol-formaldehyde resins, urea-formaldehyde resins, polyester resins, styrenated alkyd resins, alkyd resin solutions, alkyd resins, and butylated urea-formaldehyde resins.
Plant: Elizabeth, N. J.
Raw material: Benzene, formaldehyde, USP phenol, styrene, vinyl acetate monomer, and glycerin (synthetic).
Products: Maleic anhydride, phenol-formaldehyde resins, urea-formaldehyde resins, polyester resins, styrenated alkyd resins, polyvinyl acetate emulsions, alkyd resins, and ester gum.
• Construction: Scheduled for completion late 1960 is a $5,000,000 maleic anhydride plant with capacity of 20,000,000 lb. per year. Raw material will be benzene.
Plant: Hampton, S. C.
Raw material: Methanol (from natural gas).
Product: Formaldehyde.
Plant: Houston, Tex.
Raw material: Styrene and petroleum solvents.
Products: Polyester resins and alkyd resins.

Plant: Jacksonville, Fla.
Raw material: Formaldehyde.
Products: Urea-formaldehyde resins.
Plant: Kansas City, Kans.
Raw material: Formaldehyde, USP phenol, vinyl acetate monomer, and methanol (from natural gas).
Products: Phenol-formaldehyde resins, polyvinyl acetate emulsions, and formaldehyde.
Plant: Seattle.
Raw material: USP phenol, formaldehyde, and methanol (from natural gas).
Products: Pentachlorophenol, phenol-formaldehyde resins, and formaldehyde.
Plant: South San Francisco, Calif.
Raw material: Formaldehyde, USP phenol, petroleum solvents, and vinyl acetate monomer.
Products: Phenol-formaldehyde resins, urea-formaldehyde resins, alkyd resin solutions, and polyvinyl acetate emulsions.
Plant: Tacoma, Wash.
Raw material: Methanol (from natural gas), formaldehyde, and USP phenol.
Products: Formaldehyde, phenol-formaldehyde resins, pentachlorophenol, and polyester resins.
Plant: Tuscaloosa, Ala.
Raw material: Methanol (from natural gas), benzene, formaldehyde, acetaldehyde, USP phenol, and petroleum solvents.
Products: Formaldhyde, USP phenol, pentaerythritol, phenol-formaldehyde resins, and urea-formaldehyde resins.
• Construction: Formaldehyde capacity will be doubled. A $1,500,000 program is under way to expand production of pentaerythritol from formaldehyde and acetaldehyde.

REPUBLIC OIL & REFINING CO., Division of Plymouth Oil Co., Benedum Trees Building, Pittsburgh 22, Pa.
Plant: Texas City, Tex.
Raw material: Refinery-gas streams.
Products: Butane and butylenes, ethylene, propylene tetramer, and propylene trimer.

RICHARDSON CARBON CO., SID, 629 Fort Worth Club Building, Fort Worth 2, Tex.
Plant site: Big Spring, Tex.
• Construction: A new 50,000,000-lb. per year furnace carbon-black plant will be built adjacent to the Cosden Petroleum Corp. refinery.

RICHARDSON GASOLINE CO., SID, 629 Fort Worth Club Building, Fort Worth 2, Tex.
Plant: Keystone field, Winkler County, Texas.
Product: 5 tons per day of sulfur from natural gas.

RICHFIELD OIL CORP., 555 S. Flower St., Los Angeles 17, Calif.
Plant: Wilmington, Calif.
Raw material: Petroleum fractions, refinery cracked gases, and propylene polymer.
Products: Naphthenic acids, ethylene-ethane stream, benzene (18,000,000 gal. per year), toluene (18,000,000 gal.), mixed xylenes (335 bbl. per day), and propylene tetramer and trimer.
Plant site: Watson, Calif.
• Construction: New facilities planned for production of high-purity propylene, with completion 1961.

ROHM & HAAS CO., Washington Square, Philadelphia 5, Pa.
Plant: Deer Park, Pasadena, Tex.
Raw material: Natural gas.
Products: Methanol, ammonia, acetylene, carbon monoxide, hydrogen, hydrogen cyanide, acetone, acetone cyanohydrin, methyl methacrylate, and methyl and ethyl acrylate.

SHAMROCK OIL & GAS CORP., Box 631, Amarillo, Tex.
Plant: Sunray, Tex.
Raw material: Sour natural gas and refinery gas.
Product: 30 long tons per day of sulfur.

SHELL CHEMICAL CO., 50 West 50 St., New York 20, N. Y.
Plant: Denver, Colo.
Raw material: Petroleum hydrocarbons.
Products: Aldrin, dieldrin, endrin, methyl parathion, insecticide, and soil fumigant.
Plant: Dominguez, Calif.
Raw material: Petroleum hydrocarbons.
Products: Isopropyl alcohol, acetone, methyl ethyl ketone, methyl isobutyl ketone, diacetone alcohol, sec.-butyl alcohol, mesityl oxide, and methyl isobutyl carbinol.
Plant: Houston.
Raw material: Petroleum hydrocarbons.
Products: Acetone, diacetone alcohol, ethyl alcohol, hexylene glycol, isopropyl alcohol, isopropyl ether, mesityl oxide, methyl ethyl ketone, methyl isobutyl carbinol, methyl isobutyl ketone, sec.-butyl alcohol, allyl alcohol, allyl chloride, epichlorohydrin, ethyl chloride, glycerin, epoxy resins, D-D soil fumigant, phenol, bisphenol A, and sulfur.
Plant: Martinez, Calif.
Raw material: Petroleum hydrocarbons.
Products: Ethyl amyl ketone, tertbutyl alcohol, Ionol antioxidant, p-tert-butyl benzoic acid, ditertiary butyl peroxide, octyl formol, methyl ethyl ketone peroxide, tertiarybutyl hydroperoxide, Bionox M, acrolein derivatives, and mono, di and triallylamines.
Plant site: New Jersey.
• Construction: A 180-acre tract has been purchased from Swarthmore College across the Delaware River from Philadelphia. The company plans to build a synthetic resins and plastic plant at the site.
Plant: Norco, La.
Raw material: Petroleum hydrocarbons.
Products: Crude chlorohydrins, allyl chloride, D-D soil fumigant, hydrogen peroxide, and sec.-butyl alcohol.
• Construction: Facilities for production of acrolein and glycerin to go on stream third quarter 1960.
Plant: Shell Point (Pittsburg), Calif.
Raw material: Natural gas.
Products: Ammonia (100,000 tons per year), ammonium sulfate (150,000 tons per year), diammonium phosphate, and catalysts.
Plant: Torrance, Calif.
Products: SBR copolymer (126,000 long tons per year), butadiene (70,000 short tons per year), styrene (135,000,000 lb. per year), and polyisoprene (has been about 5 tons per year).
• Construction: Polyisoprene production is being expanded to 40,000,000 lb. per year starting October 1960. Also scheduled for completion early in 1961 is expansion of styrene capacity to 210,000,000 lb. per year.
Plant: Ventura, Calif.
Raw material: Natural gas.
Products: Ammonia (200 tons per day) and urea (100 tons per day).
Plant: Wallingford, Conn.
Product: High-impact polystyrene is being produced on a commercial scale for Shell Chemical Co. at the American Cyanamid Co. plant at Wallingford.
Plant site: Somewhere in the Middle West.
• Construction: Shell will build a polyisoprene plant at a location yet to be decided, with capacity of 80,000,000 lb. per year when completed third quarter 1961.

SHELL OIL CO., 50 W. 50 St., New York 20, N. Y.
Plant: Houston, Tex.
Raw material: Refinery streams.
Products: Benzene-1° (1,000 bbl. per day) and toluene-1° (2,200 bbl. per day).
Plant: Martinez, Calif.
Raw material: Refinery streams.
Products: Petroleum sulfonates (sodium salt).
Plant: Wilmington, Calif.
Raw material: Refinery streams.
Products: Xylene-3° (200 bbl. per day), toluene (400 bbl. per day), benzene (600 bbl. per day), and cresylic acid.
Plant: Wood River, Ill.
Raw material: Refinery streams.
Products: Toluene (700 bbl. per day) and xylenes (600 bbl. per day).

SIGNAL OIL & GAS CO., 811 W. 7 St., Los Angeles, Calif.
Plant: Tioga, N. D.
Product: 60 tons of sulfur per day from natural gas.
Plant: Houston, Tex. (operated by Signal's Houston Division, formerly Eastern States Petroleum & Chemical Corp.).
Raw material: Refinery stream.
Products: Benzene (700 bbl. per day), toluene (1,100 bbl. per day), xylene (1,200 bbl.), hexane (200 bbl.), heptane 200 bbl.), aliphatic solvents (1,400 bbl.), and aromatic solvents (600 bbl. per day).

SINCLAIR-KOPPERS CHEMICAL CO. (Sinclair Oil Corp. and Koppers Co., Inc.), 600 Fifth Ave., New York 20, N. Y.
Plant site: Houston, Tex.
• Construction: Facilities to produce 70,000,000 lb. per year of styrene monomer from petroleum fractions will be completed third quarter 1961.

SINCLAIR PETROCHEMICALS, INC., 600 Fifth Ave., New York 20, N. Y.
Plant: Corpus Christi, Tex.
Raw material: Petroleum fractions.
Products: Aromatic solvents.
Plant: East Chicago, Ind.
Raw material: Petroleum fractions.
Products: Antioxidants, aromatic solvents, gear-oil additives, turbine-oil additives, cutting-oil additives, and cresylic acids.
Plant: Hartford, Ill.
Raw material: Petroleum fractions.
Products: Aromatic solvents.
Plant: Houston, Tex.
Raw material: Petroleum fractions.
Products: Oil-layer-type petroleum sulfonates (barium, calcium, and sodium salts); corrosion inhibitors; isoparaffinic odorless solvents; cresylic acids; and toluene, para-xylene, and xylenes (60,000,000 gal. per year).

• Construction: Facilities to produce 70,000,000 lb. per year of ortho-xylene from petroleum fractions will be completed second quarter 1961.
Plant: Marcus Hook, Pa.
Raw material: Petroleum streams.
Products: Cresylic acids.
Raw material: Catalytic reformate.
Products: Toluene (400 bbl. per day), para-xylene (12,000,000 lb. per year), xylene solvents (1,000 bbl. per day), and heavy aromatic solvents.
Raw material: Refinery gas.
Product: High-purity propylene.
Raw material: Petroleum fractions.
Product: Durene.
Plant: Sand Springs, Okla.
Raw material: Petroleum fractions.
Products: Demulsifying agents, corrosion inhibitors, acid-layer-type petroleum sulfonate (sodium salt), and oil-layer-type petroleum sulfonate (sodium salt).

SINCLAIR REFINING CO., 600 Fifth Ave., New York 20, N. Y.
Plant: Houston, Tex.
Product: 30 tons per day of sulfur from refinery gas.
Plant: Marcus Hook, Pa.
Product: Sulfur from refinery gas.

SMITH DOUGLASS CO., INC., Box 9747, Houston 15, Tex.
Plant: Houston.
Raw material: Natural gas.
Product: Anhydrous ammonia.

SOHIO CHEMICAL CO., Box 628, Lima, Ohio.
Plant: Lima.
Raw material: Natural gas and refinery offgas.
Products: Anhydrous ammonia (300 tons per day), aqua ammonia, nitrogen solutions and combinations of ammonia, ammonium nitrate, urea solutions, coated 45% or uncoated 46% urea, feed-grade urea, chemical-grade urea, nitric acid, and carbon dioxide.
Raw material: Propylene and ammonia.
Products: Acrylonitrile and acetonitrile.

SOLAR NITROGEN CHEMICALS CO. (joint subsidiary of Atlas Powder Co. and Standard Oil Co. of Ohio, Midland Building, Cleveland 15, Ohio).
Plant: Lima, Ohio.
Raw material: Natural gas.
Products: Anhydrous ammonia and urea.
Plant site: Joplin, Mo.
• Construction: Plant to produce 300 tons per day of anhydrous ammonia and urea from natural gas will be completed in 1961.

SONNEBORN CHEMICAL & REFINING CORP., 300 Fourth Ave., New York 10, N. Y.
Plant: Petrolia, Pa. (operated by Sonneborn's Daugherty Refinery Division).
Raw material: Petroleum fractions.
Products: Oil-layer type of petroleum sulfonate (sodium and alkaline earth salts), and water-soluble petroleum sulfonate.

SOUTHERN NITROGEN CO., INC., Box 246, Savannah, Ga.
Plant: Savannah.
Raw material: Natural gas.
Products: Anhydrous ammonia (100,000 tons per year), aqua ammonia, nitrogen solutions, prilled ammonium nitrate, calcium ammonium nitrate, and crystal urea.
• Construction: Scheduled for completion January 1, 1961, is a project to boost urea facilities from 10,000 to 16,000 tons per year. Scheduled for completion October 1, 1961, is a project to increase nitric acid facilities from 100,000 to 130,000 tons per year.

SPENCER CHEMICAL CO., 610 Dwight Building, Kansas City 5, Mo.
Plant: Calumet City, Ill.
Raw material: Methanol and ammonia.
Products: Formaldehyde and aqua ammonia.
Plant: Fort Worth, Tex.
Raw material: Natural gas.
Products: Dry ice and liquid CO_2.
Plant: Henderson, Ky.
Raw material: Natural gas.
Products: Ammonia (200 tons per day), nitric acid, ammonia solutions, urea (100 tons per day), and aqua ammonia.
Raw material: Caprolactum.
Products: Nylon-6 molding resins.
Plant: Orange, Tex.
Raw material: Ethylene.
Product: Polyethylene (120,000,000 to 135,000,000 lb. per year).
Plant: Pittsburg, Kans.
Raw material: Natural gas.
Products: Ammonia (500 tons per day), nitric acid, aqua ammonia, ammoniating solutions, ammonium nitrate, dry ice, uranium dioxide, and methanol.
Plant: Vicksburg, Miss.
Raw material: Natural gas.
Products: Ammonia (200 tons per day), nitric acid, ammonia solutions, and urea (11,000 tons per year).

ST. PAUL AMMONIA PRODUCTS, INC., Box 418, South St. Paul, Minn.
Plant: Pine Bend, South St. Paul.
Raw material: Natural gas.
Products: Ammonia (225 tons per day) and ammonium nitrate solutions.
• Construction: The company plans to expand capacity to more than 300 tons per day, with construction to start fall 1960 and completion spring 1961.

STANDARD OIL CO. (IND.), 910 S. Michigan Ave., Chicago 80, Ill.
Plant: Sugar Creek, Mo.
Raw material: Petroleum fractions.
Products: Heptene concentrate and sodium cresylate.
Plant: Whiting, Ind.
Raw material: Petroleum fractions.
Products: Benzene-1°, nitration grade toluene and xylenes-10°, acid-layer-type petroleum sulfonate, sodium cresylate, petroleum-base plasticizers, and sulfur from refinery gas.
Plant: Wood River, Ill.
Raw material: Heptene and nonene from olefin feed.
Products: Isooctyl, decyl or higher alcohols.
Raw material: Petroleum fractions.
Products: Polybutene and high-molecular weight hydrocarbons, lube-oil detergent and corrosion-inhibitor additives, gasoline and distillate-fuel additives, and sodium cresylate.

STANDARD OIL CO. OF CALIFORNIA, 225 Bush St., San Francisco 20, Calif.
Plant: El Segundo, Calif.
Raw material: Petroleum base stocks.
Products: Benzene (1,500 bbl. per day), toluene, para-xylene, cumene, butadiene (16,000 short tons per year), and butylene (1,870 bbl. per day).
Plant: Richmond, Calif.
Raw material: Petroleum base stocks and natural gas.
Products: Ammonia, nitric acid, ortho-xylene, meta-xylene, para-xylene, industrial xylenes, alkyl aromatic detergents in various forms, metallic naphthenates, naphthenic acids, cresylic acids, petroleum sulfonates, polybutenes, gas odorants, ethyl mercaptans, isophthalic acid, phthalic anhydride, phenol, acetone, benzoic-toluic acid, and terephthalic acid.
• Construction: New facilities for production of 20,000,000 lb. per year of maleic anhydride. Also, Oronite Chemical Co., Standard of California subsidiary which operates polybutene facilities at Richmond, will double polybutene capacity in a $3.4-million expansion program, with completion in 1961.

STAUFFER CHEMICAL CO., 380 Madison Ave., New York 17, N. Y.
Plant: Baton Rouge, La.
Raw material: Refining sludge acid and refinery H_2S gas stream.
Products: Sulfuric acid and sulfur.
Plant: Baytown, Tex.
Product: More than 100 tons per day of sulfur from refinery gas.
Plant: Dominguez, Calif.
Product: Sulfuric acid from refinery sludge acid or H_2S.
Plant: Hammond, Ind.
Product: Refinery spent acid is used to make virgin sulfuric acid.
Plant: Houston, Tex.
Product: Sulfuric acid from refinery sludge.
Plant: Le Moyne, Ala.
Raw material: Natural gas.
Product: Sulfur used captively to make carbon disulfide.
Plant: Louisville, Ky.
Raw material: Propane, propylene, and natural gas.
Products: Carbon tetrachloride, perchlorethylene, chloroform, methylene chloride, and hydrogen chloride.
Plant site: Delaware City, Del.
• Construction: This new plant to make carbon disulfide from methane and sulfur is due on stream November 1960.

STAUFFER CHEMICAL CO., SHELL CHEMICAL CO., and **WESTERN STATES CHEMICAL.**
Plant site: Dominguez, Calif.
• Construction: These three companies have formed a new company to build a plant to produce more than 50,000 tons per year of complex solid nitrogen, phosphate, and potash fertilizer.

SUN OIL CO., 1608 Walnut St., Philadelphia 3, Pa.
Plant: Marcus Hook, Pa.
Raw material: Refinery streams.
Products: Propylene (120,000,000 lb. per year), petroleum sulfonates, naphthenic acids, propylene tetramer (dodecene), propylene trimer (nonene), benzene (800 bbl. per day), toluene (2,000 bbl. per day), mixed xylenes (500 bbl. per day), ammonia (300 tons per day), and sulfur (30 tons per day).
Plant: Toledo, Ohio.
Raw material: Refinery streams.
Products: Butylenes, propylene, hydrogen, and sulfur (12½ tons per day).
• Construction: Plans call for capacity of 100,000,000 lb. per year of naphthalene from refinery streams to be completed late 1961 at cost of $8,000,000.

SUNOLIN CHEMICAL CO. (Sun Oil Co. and Olin Mathieson Chemical Corp.), 1608 Walnut St., Philadelphia 3, Pa.
Plant: North Claymont, Del.

Raw material: Ammonia and carbon dioxide.
Product: 73,000 tons per year of urea.
• Construction: Scheduled for completion late 1961 are facilities to produce 225,000,000 lb. per year of ethylene and 55,000,000 lb. per year of ethylene oxide, using dry gas as raw material. Cost will be $20,000,000.

SUNTIDE REFINING CO., Box 658, Corpus Christi, Tex.
Plant: Corpus Christi.
Raw material: Propylene.
Product: 150,000 bbl. per year of tetramer.
Raw material: Naphtha.
Products: Benzene (420 bbl. per day), toluene (1,200 bbl. per day), m-xylene and p-xylene mixture—2% max. o-xylene (870 bbl. per day), o-xylene—90% min. o-xylene (260 bbl. per day), and heavy aromatic solvent (140 bbl. per day).
• Construction: Benzene capacity will be boosted to 1,250 bbl. per day when a $1,300,000 project is completed in January 1961. Raw material will be toluene. New facilities to produce 60,000,000 lb. per year of styrene will be completed early in 1962 at a cost of $3,500,000.

TENNESSEE EASTMAN CO. (Eastman Chemical Products, Inc., Kingsport, Tenn.).
Plant site: Kingsport.
• Construction: A high-purity hydrogen plant, with capacity of 900,000 cu. ft. per day, is scheduled for completion in 1960. Natural gas is raw material.

TENNESSEE OIL REFINING CO., Division of Tennessee Gas Transmission Co., Box 2511, Houston, Tex.
Plant site: Chalmette, La.
• Construction: Scheduled for completion in spring 1961 are facilities for production of 2,000 bbl. per day of benzene, toluene, and xylenes, from crude oil.

TENNESSEE VALLEY AUTHORITY, Wilson Dam, Ala.
Plant: Noncommercial plant owned and operated by the Government at Wilson Dam.
Raw material: Natural gas.
Product: 250 tons per day of ammonia.

TEXACO INC., 135 E. 42 St., New York 17, N. Y.
Plant: Lockport, Ill.
Raw material: Refinery fractions.
Products: Anhydrous ammonia (180 tons per day of refrigeration, commercial, and agricultural grades), aqua ammonia (industrial and agricultural grades), nitrogen fertilizer solutions, ammonium nitrate solutions, and odorless mineral spirits.
Plant: Los Angeles, Calif.
Product: Sulfur from refinery gas.
Plant: Port Arthur, Tex.
Raw material: Refinery fractions.
Products: Naphthenic acid, oil-layer type of petroleum sulfonates, ethane-ethylene stream, propane-propylene mixture, 1-butene, 2-butene and mixtures, heavy hydrocarbons, olefin polymers, diisobutylene, rust inhibitors, gasoline and lubricating-oil additives, and propylene tetramer.
Plant site: Westville, N. J.
• Construction: Facilities for production of cumene from propylene and benzene scheduled for completion fourth quarter 1960.

TEXACO-SEABOARD, INC. (subsidiary of Texaco Inc.).
Plant: Silver Tip field, Wyoming.
Product: 50 long tons per day of sulfur from natural gas.

TEXAS BUTADIENE & CHEMICAL CORP., 529 Fifth Ave., New York, N. Y.
Plant: Channelview, Tex.
Raw material: n-butane, isobutane, isopentane, and natural gasoline.
Products: Alkylate, butene-2 concentrate, butene-1 concentrate, propylene concentrate, solvents, and butadiene (85,000 short tons per year, which can be increased to 110,000 depending on amount of alkylate and aviation gasoline also made at this plant).

TEXAS EASTMAN CO. (Eastman Chemical Products, Inc., Kingsport, Tenn.).
Plant: Longview, Tex.
Raw material: Propane and natural gas.
Products: Ethanol, isobutyraldehyde, normal-butyraldehyde, isobutyl alcohol, isobutyronitrile, n-butyronitrile, acetonitrile, polyethylene (100,000,000 lb. per year), 2-ethylhexyl alcohol, neopentyl glycol, and propionaldehyde. (Aldehydes capacity is 125,000,000 lb. per year.)
• Construction: Scheduled for completion in 1961 are facilities to make 20,000,000 lb. of polypropylene per year from propane.

TEXAS GULF SULPHUR CO., 75 E. 45 St., New York, N. Y.
Plant: Worland, Wyo.
Product: 400 tons per day of sulfur from natural gas.

TEXAS-U. S. CHEMICAL CO., 260 Madison Ave., New York 16, N. Y.
Plant: Port Neches, Tex.
Product: 143,000 gross long tons per year of SBR copolymer.
• Construction: Output will be increased about 10% when expansion completed late 1960.

THERMATOMIC CARBON CO., Division of Commercial Solvents Corp., 260 Madison Ave., New York 16, N. Y.
Plant: Sterlington, La.
Product: Carbon black (thermal process).

TIDEWATER OIL CO., 4201 Wilshire Blvd., Los Angeles 5, Calif.
Plant: Avon, Calif.
Raw material: Naphtha fraction.
Products: 1,200 bbl. per day of mixed aromatics.
Plant: Delaware City, Del.
Raw material: Naphtha fraction.
Products: Mixed aromatics (400 bbl. per day) and sulfur (275 tons per day).
Plant: New Hope-Smackover field in Northeast Texas.
Product: 224 tons of sulfur per day from natural gas.

TIDEWATER OIL CO. and **COLLIER CARBON & CHEMICAL CORP.**
Plant site: Delaware City, Del.
• Construction: New naphthalene plant planned here will have capacity of 50,000,000 lb. per year.

TRANS-JEFF CHEMICAL CORP., owned jointly by Jefferson Lake Sulphur Co. and Transcontinental Gas Pipe Line Corp., Box 296, Houston 1, Tex.
Plant site: Tilden, Tex.
• Construction: New plant to recover sulfur from natural gas is set for completion November 1960.

TRETOLITE CO., Division of Petrolite Corp., 369 Marshall Ave., St. Louis 19, Mo.
Plant: St. Louis.
Raw material: Petroleum hydrocarbons and chemicals.
Products: Demulsifiers, corrosion inhibitors, water-flood additives, paraffin removers, scale preventives, fuel additives, desalting chemicals, and metal deactivators.

TRETOLITE CO. OF CALIFORNIA, Division of Petrolite Corp., 369 Marshall Ave., St. Louis 19, Mo.
Plant: Brea, Calif.
Raw material: Petroleum hydrocarbons and chemicals.
Products: Demulsifiers, corrosion inhibitors, water-flood additives, paraffin removers, scale preventives, fuel additives, desalting chemicals, metal deactivators, and asphalt additives.

UNION CARBIDE CORP., 30 E. 42 St., New York 17, N. Y.
Plant site: Brownsville, Tex.
• Construction: The company is converting the former Amoco Chemicals Corp. synthetic fuels plant at Brownsville to a petrochemical plant. When completed early 1961, products will include acetic acid, acetic anhydride, and methyl ethyl ketone.

UNION CARBIDE CARIBE, INC., (subsidiary of Union Carbide Corp.).
Plant: Ponce, Puerto Rico.
Product: Ethylene oxide-glycol.
• Construction: New plant for production of 110,000,000 lb. per year of polyethylene will be completed second half 1962, at estimated cost of $20,000,000.

UNION CARBIDE CHEMICALS CO., Division of Union Carbide Corp.
Plant: Institute, W. Va.
Raw material: Natural gas and other petroleum streams.
Products: Acetaldehyde, acetic acid, acetic anhydride, acetone, acetonitrile, acetophenone, acrolein, acrylonitrile, n-butyl alcohol, butyric acid, butyric anhydride, diethylene glycol, diisobutyl ketone, 2-ethylbutanol, ethylene glycol, ethylene oxide, 2-ethylhexanol, n-hexanol, isophorone, isopropanol, maleic anhydride, mesityl oxide, methyl acetone, 2-methyl-5-ethyl pyridine, methyl isobutyl ketone, paraldehyde, plasticizers, alpha-picoline, gamma-picoline, polyethylene glycols, propionic anhydride, trimethyl nonanone-4, and unox epoxides.
Plant: Seadrift, Tex.
Raw material: Natural gas (ethane).
Products: Polyethylene, ethylene oxide, ethylene glycol, and butadiene.
• Construction: Low-density polyethylene capacity will be increased by 170,000,000 lb. per year at the Seadrift and Texas City plants, with completion in 1961.
Plant: South Charleston, W. Va.
Raw material: Natural gas, refinery gases, crude oil, and other petroleum fractions.
Products: Alcohols; butadiene; esters; ketones; glycol-ethers; plasticizers such as dioctyl phthalate and others; glycols such as ethylene-, di-and-triethylene glycols and others; polyethylene plastic; synthetic lubricants; oxides (ethylene and propylene oxides and acetals), aldehydes; organic acids; anhydrides; nitrogen compounds such as acetonitrile, amines (mono, di, and triethanol amines,

morpholine and other amines); chlorine compounds such as ethylene dichloride, ethylene and propylene chlorhydrin; aryl chemicals such as acetoacetanilide, 2-methyl-5-ethyl pyridine; surface-active agents (ionics and anionics); and methyl isoamyl ketone.

Plant: Texas City, Tex.

Raw material: Natural gas and refinery gases (ethane, propane).

Products: Acetaldehyde, acetic acid, acetic anhydride, acetone, 2-aminoethyl ethanolamine, n-butyl acetate, n-butyl alcohol, diethylene glycol, diethylene triamine, ethanol, ethyl acetate, ethylene diamine, ethylene dichloride, ethylene glycol, ethylene oxide, butadiene, isobutanol, isopropanol, isopropyl, acetate, methanol, methyl acetone, methylisobutyl ketone, polyethylene, tetraethylene pentamine, trichlorethane, triethylene tetramine, vinyl acetate, vinyl chloride, and other vinyl resins and vinyl plastic materials. (Acetylene made from natural gas and ethylene made from natural gas and/or refinery gases are used internally.)

• Construction: Low-density polyethylene capacity at Texas City and Seadrift will be increased by 170,000,000 lb. per year, with completion in 1961.

Plant: Torrance, Calif.

Raw material: Refinery cracked gases (ethylene).

Products: Low density polyethylene, ethylene oxide, and ethylene glycol.

Plant: Whiting, Ind.

Raw material: Refinery gases.

Products: Acetic anhydride, acetone, ethanol, ethylene oxide and glycol, isopropanol, methyl ethyl ketone, and methyl isobutyl ketone.

• Construction: Building a 72,000,000-lb. per year low density polyethylene plant.

UNION CARBIDE PLASTICS CO. (Division of Union Carbide Corp.).

Plant: Marietta, Ohio.

Raw material: Petroleum-derived stocks.

Products: Styrene plastics, phenol, and epoxy resins (15,000,000 lb. per year).

• Construction: Capacity of phenol facilities is being boosted from present 85,000,000 to 110,000,000 lb. per year, with completion late 1960 or early 1961.

UNION OIL CO. OF CALIFORNIA, Union Oil Center, Los Angeles 17, Calif.

Plant: Oleum, Calif.

Product: 25,000 tons per year of sulfur from refinery gas.

Plants: Santa Maria, Calif.

Product: Combined capacity of two plants at Santa Maria is 17,500 tons of sulfur per year.

Plant: Wilmington, Calif.

Raw material: Refinery gases and wastes.

Products: Ammonium sulfate (21,000 tons per year); mixture of methyl-ethyl mercaptans; and sulfur (23,000 tons per year).

UNITED CARBON CO., INC., Box 1503, Houston 1, Tex.

Plants: Furnace process for production of carbon black used at Aransas Pass and Shamrock, Tex.; Franklin, La.; and Ryus, Kans.

Plants: Channel process for production of carbon black used at Aransas Pass, Tex. (20,000 M.c.f. per day throughput); Eunice, N. M. (96,000 lb. per day); and Falfurrias, Tex. (12,000 lb. per day).

Plant: Baytown, Tex.

Product: 145,000,000 lb. per year of SBR copolymer.

• Construction: The company will spend $1 million to expand SBR capacity to 200,000,000 lb. per year.

U. S. AIR FORCE.

Plant: Near West Palm Beach, Fla.

Product: Liquid hydrogen. (Facilities for this product built and operated by Air Products, Inc.)

U. S. INDUSTRIAL CHEMICALS CO., Division of National Distillers & Chemical Corp., 99 Park Ave., New York 16, N. Y.

Plant: Houston Ship Channel.

Raw material: Ethylene.

Product: 150,000,000 lb. of polyethylene per year.

Plant: Tuscola, Ill.

Raw material: Natural gas (ethane).

Products: Polyethylene (150,000,000 lb. per year), ethanol, ethyl ether, ethyl chloride, ammonia, and ammonium nitrate.

VELSICOL CHEMICAL CORP., 330 E. Grand Ave., Chicago 11, Ill.

Plant: Galena Park, Tex.

Raw material: Petroleum fractions.

Products: Benzene, toluene, xylenes, aromatic solvent naphthas, and DDT base.

Plant: Marshall, Ill.

Raw material: Petroleum-base stocks.

Products: Benzene-1°, benzene motor grade, toluenes, xylenes, high-boiling aromatic petroleum solvents, petroleum-derived formulation solvents, and hydrocarbon polymers and resins.

VICKERS PETROLEUM CO., INC., Box 2240, Wichita 1, Kans.

Plant: Potwin, Kans.

Raw material: Catalytic reformate.

Products: Benzene (140 bbl. per day), toluene (350 bbl.), xylenes (350 bbl.), higher aromatics (300 bbl. per day), insecticide components, specialty solvents, and paint solvents.

VISCO PRODUCTS CO., INC., Box 6826, Houston 5, Tex.

Plant: Anaheim, Calif.

Raw material: Petroleum fractions and petroleum chemicals.

Products: Oil-treating chemicals, demulsifiers, corrosion inhibitors, scale inhibitors, paraffin aids, and water-flood additives.

Plant: Sugarland, Tex.

Raw material: Petroleum fractions and petroleum chemicals.

Products: Oil-treating chemicals, demulsifiers, corrosion inhibitors, scale inhibitors, paraffin aids, and water-flood additives.

WARREN PETROLEUM CORP., Box 1589, Tulsa, Okla.

Plant: Waddel, Tex.

Product: 50 tons per day of sulfur from natural gas.

Plant site: Fashing, Tex.

• Construction: New plant under construction will have capacity to produce 45 tons of sulfur per day.

WEST TEXAS CO_2 COMPANY (formed by Oil Recovery Corp. 415 Lexington Ave., New York 17, N. Y., and Helmerich & Payne, Inc., First National Building, Tulsa 3, Okla.)

Plant site: Near Fort Stockton, Tex.

• Construction: Facilities to produce 140 tons per day of liquid carbon dioxide for use in secondary-recovery projects. Completion set for October 1960.

WILSHIRE OIL CO. OF CALIFORNIA, Box 2487, Santa Fe Springs, Calif.

Plant: Santa Fe Springs.

Product: 20 tons per day of sulfur from refinery gas.

WITCO CHEMICAL CO., 122 E. 42 St., New York 17, N. Y.

Plant: Chicago, Ill.

Raw material: Petroleum naphthenic acid, petroleum wax, asphalt fractions, and naphthalene.

Products: Metallic naphthenates (paint-drying agents and lube additives), sun-checking inhibitors (rubber compounding), rubber extenders, saturating compounds, insulating mastics, and phthalic anhydride (20,000,000 lb. per year).

• Construction: Facilities to produce 30,000,000 lb. per year of alkyl-aryl sulfonates from alkyl benzene will be completed late 1960.

Plant: Lawrenceville, Ill.

Raw material: Solid petroleum tar and heavy liquid and semisolid petroleum fractions.

Products: Rubber extenders, extending plasticizers, subber softeners, roofing asphalts, insulating compounds, and potting compounds.

Plant: Los Angeles, Calif.

Raw material: Naphthenic acids.

Products: Metallic naphthenates.

Plant: Perth Amboy, N. J.

Raw material: Solid petroleum tar and heavy liquid and semisolid petroleum fractions.

Products: Rubber extenders, extending plasticizer, rubber softeners, roofing asphalts, potting compounds, and insulating compounds.

Plant site: Somewhere on East Coast.

• Construction: Plans call for construction of plant to produce 30,000,000 lb. per year of phthalic anhydride from naphthalene, with completion late 1961.

WITFIELD CHEMICAL CORP. (formed by Witco Chemical Co. and Richfield Oil Corp.).

Plant site: Los Angeles, Calif.

• Construction: A new $1,750,000 plant to produce dodecylbenzene from benzene and propylene tetramer is set for completion early 1961.

WYANDOTTE CHEMICALS CORP., Michigan Alkali Division, Wyandotte, Mich.

Plant: Geismar, La.

Raw material: Ethylene and oxygen.

Products: Ethylene oxide (60,000,000 lb. per year), ethylene glycol, and diethylene glycol.

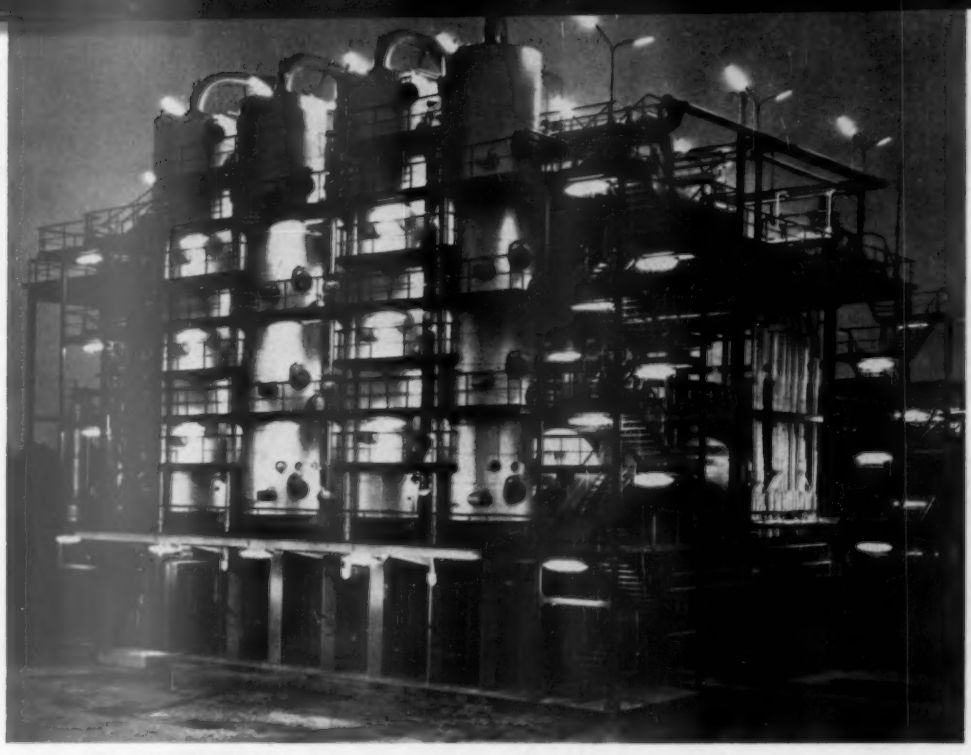
Plant: Wyandotte, Mich.

Raw material: Petroleum fractions and derivatives.

Products: Ethylene glycol, diethylene glycol, ethylene dichloride, propylene oxide, polypropylene glycols, block polymers, polyoxyalkylene compounds, chloroethers, and aromatic distillates and solvents (chlorinated solvents).

Plant site: Washington, N. J.

• Construction: Scheduled to start late 1960 is production of block polymer surfactants, polypropylene glycols, and urethane grade polyols made from propylene oxide and ethylene oxide.



TYPICAL OF WEST GERMANY'S drive to boost the capacity of petrochemical products is Buna Werke Hüls which makes butadiene, styrene, copolymer, and synthetic rubber at this plant at Marl. Capacity is being expanded from 70,000 to 120,000 tons per year.

THE OIL AND GAS JOURNAL'S 1960 SURVEY OF

Petrochemical plants outside the U. S.

ARGENTINA

DURANOR, INDUSTRIAS QUIMICAS SOC. ANON. INDUSTRIAL Y COMMERCIAL (Hooker Chemical Corp. and Atanor, Cia. Nacional para la Industria Quimica S.A.M.)
Plant site: Rio Tercero.
- Construction: Plans call for facilities to produce 25 tons per day of phenol by a newly developed Hooker process. Completion scheduled within next 18 months.

ELECTROCLOR, S.A.
Plant: Rosario.
Product: Polyvinyl chloride.

FISH INTERNATIONAL CORP., CONTINENTAL OIL CO., CITIES SERVICE CO., and WITCO CHEMICAL CO.
Plant site: Not determined.
- Construction: These companies reportedly negotiating to build petrochemical facilities. SBR synthetic rubber, carbon black, and ammonia have been mentioned as possible products.

IMPERIAL CHEMICAL INDUSTRIES (Argentine subsidiary is Industrias Quimicas Argentinas Duperial, S.A.).
Plant site: Near San Lorenzo, about 200 miles northwest of Buenos Aires.
- Construction: Plans call for a $16-million high-pressure polyethylene plant with capacity of 10,000 tons per year. Raw material will be light petroleum distillate. This company is also reportedly planning facilities to produce phthalic anhydride by 1963.

INDUSTRIAS PLASTICAS ARTENTINAS KOPPERS, S.A. (Koppers Co., Inc., and private Argentina interests.)
Plant site: La Plata near Buenos Aires.
- Construction: Scheduled for completion by 1961 are three plants: ethylene (using refinery gas as feed stock); polyethylene (initial capacity of 15,000,000 lb. per year), and styrene monomer (33,000,000 lb. per year). Estimated cost is $24 million.

MONSANTO ANDES, S.A.I.C.
Plant: Mendoza.
Products: Polyvinyl chloride resins and vinyl chloride monomer.

MONSANTO ARGENTINA, S.A.I.C.
Plant site: Buenos Aires.
- Construction: Phthalic anhydride plant.

MONSANTO OVERSEAS (a joint venture of Monsanto and Carbometal).
- Construction: Has government authority to invest in facilities for high-impact polystyrene.

TEXAS BUTADIENE & CHEMICAL CORP.
Plant site: Puerto de Seado, Comodoro Rivadavia.
- Construction: Scheduled for completion in 1962 are these three plants: butadiene (30,000 tons per year); synthetic rubber (40,000 tons per year); and carbon black (15,000 tons per year). The new complex will cost an estimated $39 million. Gas in the area will provide feed stock. The company concluded negotiations early in 1960.

AUSTRALIA

AUSTRALIAN CARBON BLACK PTY., LTD.
Plant: Altona.
Raw material: Heavy residual oil.
Product: $25,000,000 lb. per year of carbon black.

AUSTRALIAN PETROCHEMICALS, LTD. (Monsanto Chemicals, Ltd., and Petroleum & Chemicals Corp.).
Plant site: Silverwater near Sydney.
- Construction: The country's first styrene monomer plant is scheduled for completion in 1961, at cost of about $4.5 million.

AUSTRALIAN SYNTHETIC RUBBER CO. (Vacuum Oil, Pty., Ltd. and Goodyear Tire & Rubber Co.)
Plant site: Altona near Melbourne.
- Construction: An $11-million synthetic rubber plant is scheduled for completion in 1961. Capacity will be 30,000 long tons of styrene-butadiene rubber. Contractor is Fluor International, S.A. Raw material will come from Vacuum's adjacent butadiene-ethylene plant.

BITUMEN & OIL REFINERIES (AUSTRALIA), Ltd.
Plant site: Matraville, New South Wales.
- Construction: Facilities for production of benzene, toluene, and xylene are planned.

COMMERCIAL SOLVENTS PTY., LTD. (affiliated with Petroleum & Chemicals Corp.).
- Construction: Plans call for a new plant,

using xylene, toluene, and benzene as raw material.

CSRC-DOW, PTY., LTD. (Dow Chemical Co. and CSR Chemicals, Pty., Ltd.).
Plant site: Altona near Melbourne.
- Construction: New plant to produce styrene monomer, ethylene dichloride, caustic soda, and chlorine will start operations in 1961. Raw material to come from Vacuum's adjacent ethylene plant.

IMPERIAL CHEMICAL INDUSTRIES.
Plant site: Botany.
- Construction: Polyethylene plant is under way with raw materials to come from Shell's Clyde plant via pipeline. Capacity 5,000 tons per year.

MONSANTO CHEMICALS (AUSTRALIA) and **CONSOLIDATED ZINC PTY.**
Plant site: Sydney.
- Construction: These companies are forming a new company to build a fluorocarbon production unit.

SHELL CHEMICAL (AUSTRALIA).
Plant: Geelong, Victoria.
Raw material: From Shell refinery.
Product: Sulfuric acid.
- Construction: Expansion here will include manufacture of alkylated aromatics.

Plant site: Clyde.
- Construction: Epoxy-resin plant to cost $2.5 million is planned, and ethylene plant to cost $22 million is expected on stream by 1962. This plant will will feed ICI's polyethylene plant at Botany.

UNION CARBIDE AUSTRALIA, LTD.
Plant site: Melbourne.
- Construction: New polyethylene unit with capacity of 15,000,000 lbs. per year is scheduled to go on stream in 1961. It will be adjacent to Vacuum's plant. Cost will be $6.5 million.

VACUUM OIL, PTY., LTD.
Plant site: Altona near Melbourne.
- Construction: Plant with capacity of 20,000 tons per year of ethylene and butadiene to supply Australian Synthetic's rubber plant. Completion scheduled 1961. Cost will be $28 million. Raw material will come from Standard-Vacuum's Altona refinery.

AUSTRIA

DANUBIA PETROCHEMIE, A.G. (joint subsidiary of Austrian Nitrogen Works and Montecatini).
Plant: Schwechat near Vienna.
Raw material: From new Schwechat refinery.
Product: 5,000 metric tons per day of polypropylene plastic.

OESTERREICHISCHE HIAG-WERKE, A.G.
Product: 8,000 tons per year of methanol.

VEDEPHA G.M.B.H.
Product: Polyvinyl acetate.

VEREINIGTE CHEMISCHE FABRIKEN KREDIDL, RUTTER & CO.
Product: 20,000 tons per year of formaldehyde.

BELGIUM

AMOCO FINA, S.A. (owned jointly by Amoco Chemicals Corp. and Petrofina).
Plant site: Antwerp.
- Construction: Plant to manufacture additives for petroleum products, with completion by early 1961.

COBENAM, S.A. (subsidiary of Union Carbide Corp. and Ste. Chimique des Derives du Petrole, S. A.—Petrochim).
Plant site: Antwerp.
- Construction: Polyethylene plant with capacity of 30,000,000 lb. per year scheduled on stream late 1961.

STE. INDUSTRIELLE DE LA CELLULOSE (SICAC) and **MONSANTO CHEMICAL CO.**
Plant site: Ghent.
- Construction: Joint subsidiary formed to build a plant for polyvinyl butyral sheets, with completion 1961.

STE. CHIMIQUE DES DERIVES DU PETROLE.
Plant. Antwerp.
Product: Ethylene oxide.

UNION CHIMIQUE BELGE, S. A.
Plant site: Ghent.
- Construction: 5,000-metric-ton per year phthalic anhydride plant to be built by Badger, N.V., contractor, with completion early 1961. Cost will be $2 million.

BOLIVIA

BOLIVIAN OIL COMPANY, S.A.
- Construction: This company reportedly plans an 8,000-ton per year carbon-black plant, with locally produced gas as raw material.

BRAZIL

ALBA (BORDEN).
Plant: Cubatao near Sao Paulo.
Products: 30 tons per day of methanol, formaldehyde, and synthetic resins.

CIA. DE CARBONOS COLEDAIS.
Plant site: Mataripe.
- Construction: This company reportedly plans facilities to produce 15,000 tons per year of carbon black, with completion in 1961.

CIE. PETROQUIMICA BRASILEIRA-COPEBRAS (Major partners are Columbian Carbon Co. and Celanese Corp. of America).
Plant: Piassaguera, Sao Paulo, about 15 miles from Santos.
Product: 60,000,000 lb. per year of carbon black.

CIA. PETROQUIMICA NACIONAL (COPENAL), set up by Bakol, S.A.; Trol, S.A.; and others.
Plant site: Unknown.
- Construction: Plans call for facilities to make 5,000 tons per year of low-pressure polyethylene.

INDUSTRIA CHEMICA BRASIL.
- Construction: Ziegler-type polyethylene plant planned.

NORTH AMERICAN SOLVAY, INC.
Plant: Sao Paulo.
Product: Ethylene (purification).
- Construction: Low-pressure polyethylene production due in 1961.

PETROLEO BRASILEIRO, S.A.
Plant site: Near Rio de Janeiro.
- Construction: Firestone Tire & Rubber Co. and Goodyear Tire & Rubber Co. are installing a synthetic-rubber plant near Petrobras' refinery. The project will cost $6 million, will have capacity of 40,000 tons per year, and is scheduled for completion in 1962.

Plant: Cubatao near Sao Paulo.
Raw material: Refinery gas.
Products: Ammonia and urea.

UNION CARBIDE DO BRASIL.
Plant: Cubatao.
Raw material: Refinery feed stocks.
Product: 4,500 tons per year of polyethylene.

CANADA

B-A SHAWINIGAN, LTD. (British American Oil Co. and Shawinigan Chemicals, Ltd.) Box 338, Montreal 3, Que.
Plant: Montreal.
Raw material: Cumene.
Products: Phenol (more than 35,000,000 lb. per year), acetone (more than 21,000,000 lb. per year), isopropanol, methyl styrene, and bis-phenol.
- Construction: Expansion of phenol and acetone facilities scheduled for completion September 1960.

BRITISH AMERICAN OIL CO., LTD., 800 Bay St., Toronto 5, Ont.
Plant: Montreal, Que.
Raw material: Propylene and benzene.
Product: Cumene.
- Construction: Work to start fall 1960 on new Udex unit for production of benzene, with provision for production of toluene and xylenes. Cost will be $2,500,000, with completion before July 1, 1961.

Plant: Nevis field-processing plant in Alberta.
Product: Sulfur from wet sour gas (production 28 tons per day).
Plant: Pincher Creek field, Alberta.
Product: Sulfur from wet sour gas (production 475 tons per day).
Plant site: Rimbey, Alta.
- Construction: Products from new field-processing plant will include sulfur when completed November 1, 1960.

BROCKVILLE CHEMICALS, LTD.
Plant site: Maitland, Ont.
- Construction: Plans to complete a petrochemical plant here by spring 1961 for production of synthetic ammonia, hydrogen, nitrogen solutions, ammonium nitrate, and others, with natural gas from Alberta as raw material.

CABOT CARBON CO. OF CANADA, LTD., Box 305, Sarnia, Ont.
Plant: Sarnia.
Raw material: Petroleum fractions.
Product: More than 55,000,000 lb. per year of oil-type furnace black.

CALIFORNIA STANDARD CO., Medical Arts Building, Calgary, Alta.
Plant: Nevis field, near Stettler, Alta.
Product: Sulfur from natural gas (production 65 tons per day).
Plant site: Homeglen-Rimbey field, Alberta.
- Construction: New field-processing plant capacity will include 300 long tons per day of sulfur, with completion late 1960.

CANADIAN CHEMICAL CO., LTD., Box 99, Edmonton, Alta. (subsidiary of Celanese Chemical Corp.).

Plant: Edmonton.
Products: Pentaerythritol (10,000 tons per year), methanol, propylene glycol, dipropylene glycol, n-propanol, n-butanol, methyl isobutyl carbinol, other alcohols, acetates, acetic acid, acetic anhydride, acetone, methyl isobutyl ketone, other ketones, formaldehyde, oxides, frothing agents, xanthates, and cellulose acetates (23,000 tons per year).
• Construction: Capacity will be increased by January 1961 in a $4-million expansion program.

CANADIAN INDUSTRIES, LTD., Box 10, Montreal, Que.
Plant: Beloeil, Que.
Raw material: Pentaerythritol.
Product: Pentaerythritol tetranitrate.
Plant: Edmonton, Alta.
Raw material: Natural gas from which ethane is obtained.
Product: 40,000,000 lb. per year of polyethylene.
Plant: Millhaven, Ont.
Raw material: Ethylene glycol and dimethylester and terephthalic acid.
Products: Synthetic polyester fiber and flake.
Raw material: Bunker C fuel oil.
Product: 200 tons per day of anhydrous ammonia.

CANADIAN OIL COMPANIES, LTD., 188 University Ave., Toronto 1, Ont.
Plant: Corunna (Sarnia), Ont.
Raw material: Refinery streams.
Products: Benzene, toluene, xylene, aromatic solvents, paraffinic solvents, hydrogen, methane, ethane, ethylene, propane-propene, and butane-butene.
Plant site: Innisfail field, Alberta.
• Construction: This crude-stabilization, gas-processing, and sulfur-recovery plant will be on stream in fall 1960. Design capacity for sulfur will be about 80 long tons per day.

COLUMBIAN CARBON (CANADA), LTD., (subsidiary of Columbian Carbon Co., 380 Madison Ave., New York 17, N. Y.).
Plant site: Toronto, Ont.
• Construction: Facilities to produce 40,000,000 lb. per year of oil furnace blacks will be completed in 1961 at cost of $5,000,000.

CONSOLIDATED MINING & SMELTING CO. OF CANADA, LTD., Trail, B. C.
Plant: Turner Siding, Alta.
Raw material: Natural gas.
Products: Ammonia (320 tons per day) and ammonium nitrate (200 tons per day).
Plant: Calgary, Alta.
Product: 36,000 tons per year of urea.

CYANAMID OF CANADA, LTD., (subsidiary of American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.)
Plant: Welland, Ont.
Raw material: Natural gas.
Products: Ammonia, ammonium nitrate, and nitric acid.

DEVON-PALMER OILS LTD., 320 Seventh Ave. SW, Calgary, Alta., and Texas Gulf Sulphur Co., Inc.
Plant: Calgary.
Product: 360 long tons per day of sulfur from sour natural gas.

DOW CHEMICAL OF CANADA, LTD., Sarnia, Ont.
Plant: Sarnia.
Raw material: Hydrocarbon-rich stream, benzene, and butadiene.
Products: Carbon tetrachloride, diethanolamine, diethylene glycol, dichloroethyl ether, ethanolamine ethyl chloride, ethylene glycol, ethylene oxide, hydrochloric acid, perchloroethylene, polystyrene, polystyrene foam, styrene, styrene butadiene latexes, trichloroethylene, triethanolamine, triethylene glycol, ammonia, linear polyethylene, expandable polystyrene beads, methyl chloride, and methylene chloride.
• Construction: To be completed in October 1960 are facilities for production of vinyl chloride from chlorine and hydrocarbon. Set for completion in early 1961 are facilities to produce zoalene. Now in the engineering stage are facilities to produce propylene oxide, propylene glycol, and polyglycol.
Plant site: Fort Saskatchewan, Alta.
• Construction: New plant under construction here will produce pentachlorophenol from chlorine phenol, with completion late 1960. Also, facilities for production of glycols and amines from ethylene and ammonia are set for completion late 1961.
Plant site: Vancouver, B .C.
• Construction: Facilities for phenol production (24,000,000 lb. per year) will be completed mid-1961. Raw materials will include benzene.

DU PONT OF CANADA, LTD., Box 660, Montreal, Que.
Plant: Kingston, Ont.
Product: Nylon resin.
Plant: Maitland, Ont.
Raw material: Cyclohexane, ammonia, carbon tetrachloride, chloroform, polyacrylonitrile, and hydrofluoric acid.
Products: Adipic acid, hexamethylene diamine (nylon intermediates), chlorofluoromethanes, acrylic fiber, and hydrogen peroxide.
Plant: Sarnia, Ont.
Product: Low-pressure polyethylene.

ETHYL CORP. OF CANADA, LTD., 48 St. Clair Ave. W, Toronto, Ont.
Plant: Sarnia, Ont.
Raw material: Ethyl chloride, ethylene dichloride, and ethylene dibromide.
Product: Tetraethyl lead.
Plant site: Corunna, Ont.
• Construction: Under construction is a new plant to produce ethyl chloride and ethylene dichloride from ethylene, HCl, and chlorine. Completion scheduled November 1, 1960.

IMPERIAL OIL LTD., 111 St. Clair Ave., W, Toronto 7, Ont.
Plant: Redwater field, Alberta.
Product: Sulfur from natural gas (production 6 tons per day).
Plant: Sarnia, Ont.
Products: Tripropylene (nonene), tetrapropylene (tetramer), detergent alkylate (30,000,000 lb. per year of alkyl aryl benzene), alkylate bottoms aliphatic solvents, ethylene, propylene, butadiene, butylenes, aromatic distillates, aromatic tars, and petroleum polymers.

IRVING REFINING, LTD., Box 1260, St. John, N. B.
Plant: St. John.
Product: 30 long tons per day of sulfur from refinery gas.

JEFFERSON LAKE PETROCHEMICALS OF CANADA, LTD., Whitney Building, New Orleans, La.
Plant: Fort St. John, B. C.
Product: 300 tons per day of sulfur from natural gas.
Plant sites: Alberta.
• Construction: Plans call for two new sulfur-recovery plants. The East Calgary field plant would reportedly include output of 350 long tons of sulfur per day, with completion in November 1960. The Savanna Creek field plant would include output of 550 long tons of sulfur per day.

LAURENTIDE CHEMICALS & SULPHUR, LTD., Montreal East, Que.
Plant: Montreal East.
Product: 100 tons of sulfur per day from refinery gas.

LUBRIZOL OF CANADA, LTD., Box 26, Niagara Falls, Ont.
Plant: Niagara Falls.
Raw material: Petroleum fractions.
Products: Lube-oil additives.

MONSANTO CANADA, LTD., Box 900, Montreal 3, Que.
Plant: Montreal.
Raw material: Styrene.
Product: 20,000,000 lb. per year of polystyrene.
Plant site: LaSalle, Que.
• Construction: Scheduled for completion fourth quarter 1960 are facilities to produce several million pounds per year of maleic anhydride from benzol and benzene.

NEW SURPASS PETROCHEMICALS, LTD., 80 Richmond St. W, Toronto, Ont.
Plant: Scarborough, Ont.
Raw material: Petroleum fractions, heavy alkylate, and petroleum oxidates.
Products: Petroleum sulfonates and derivatives, lubricating greases, oil additives, and rust preventives.

NORTHWEST NITRO-CHEMICALS LTD., 260 Madison Ave., New York 16, N. Y.
Plant: Medicine Hat, Alta.
Raw material: Natural gas.
Products: Ammonia, high-analysis nitrogen, and phosphate fertilizers.

PAN AMERICAN PETROLEUM CORP., Box 591, Tulsa, Okla.
Plant site: Windfall field, 25 miles west of Whitecourt, Alta.
• Construction: New field-processing plant will be built here, with recovery to include 620 long tons of sulfur per day. Construction tentatively scheduled to start fall 1960.

POLYMER CORP., LTD. (Crown owned), Vidal St., S, Sarnia, Ont.
Plant: Sarnia.
Raw material: Refinery streams.
Products: Styrene and butadiene monomers, styrene butadiene, butyl and nitrile rubbers, ethylene, isobutylene, and special latices. (Production of all types of rubber is about 150,000 to 155,000 long tons per year.)
• Construction: In the planning stage is a cis-polybutadiene synthetic-rubber plant with proposed capacity of 20,000 tons per year. Raw material would be light gases from oil refineries.

REICHHOLD CHEMICALS (CANADA), (subsidiary of Reichhold Chemicals,

Inc., RCI Building, White Plains, N. Y.)
Plant site: Port Moody, B. C.
• Construction: Plans call for a new phenol and formaldehyde unit.
Plant site: Ste. Therese, Que.
• Construction: Installing a 7,000,000-lb. per year phthalic anhydrite unit.

ROYALITE OIL CO., LTD., Royalite Building, Calgary, Alta.
Plant: Turner Valley, Alta.
Product: 25 to 40 tons per day of sulfur from natural gas.

SHELL OIL CO. OF CANADA, LTD., 505 University Ave., Toronto, Ont.
Plant: Jumping Pound, Alta.
Product: 90 long tons per day of sulfur from natural gas.
Plant: Montreal, Que.
Raw material: Propylene, butylenes, and benzene.
Products: Isopropyl alcohol, acetone, secondary butyl alcohol, methyl ethyl ketone, epoxy resins, and detergent alkylate.

SHERRITT GORDON MINES, 2918-25 King St. W, Toronto, Ont.
Plant: Fort Saskatchewan, Alta.
Raw mtaerial: Natural gas.
Products: Ammonia (180 tons per day) and ammonium sulfate (100,000 tons per year).

SOGEMINES, LTD., Maitland, Ont.
Plant site: Maitland.
• Construction: Work is under way on new facilities to produce hydrogen, nitric acid, ammonium nitrate, nitrogen solutions, and other ammonia derivatives. Raw material will be natural gas.

ST. MAURICE CHEMICALS, Division of Shawinigan Chemicals, Ltd., 1396 St. Patrick St., Montreal, Que.
Plant: Varennes, Que.
Products: Formaldehyde and pentaerythritol.

STEELMAN GAS, LTD., 706 Seventh Ave. West, Calgary, Alta.
Plant: Steelman field, Saskatchewan.
Product: 6½ long tons of sulfur daily from natural gas.

SUN OIL CO., LTD., 85 Bloor St. East, Toronto 5, Ont.
Plant: Sarnia, Ont.
Raw material: Crude oil.
Products: Butylenes.

TEXACO CANADA LTD., 1425 Mountain St., Montreal 25, Que.
Plant site: Port Credit, Ont.
• Construction: This company will reportedly build facilities to produce 1,500 bbl. per day of benzene, with completion early 1961.

UNION CARBIDE CANADA, LTD., Chemicals and Plastics Division, 123 Eglinton Ave. E, Toronto 12, Ont.
Plant: Montreal East, Ont.
Raw material: Refinery gases.
Products: Ethylene (captive), ethylene oxide, ethylene glycols, polyethylene glycols, glycol ethers, ethanolamines, and polyethylene.
• Construction: Polyethylene capacity is being increased, with completion expected in fourth quarter 1960. Combined capacity for ethylene oxide, polyglycols, glycol ethers, and ethanolamines is being doubled, with completion scheduled first quarter 1961.

COLOMBIA

B. F. GOODRICH CHEMICAL CO. (with Colombian partners).
Plant site: Near Bogota.
• Construction: Facilities to produce polyvinyl chloride to be built here.

INDUSTRIA COLOMBIANA DE FERTIZANTES (Montecatini).
Plant: Barrancabermeja (El Centro).
Raw material: Natural gas.
Product: Ammonia.

INTERNATIONAL PETROLEUM (COLOMBIA), LTD. and **INTERNATIONAL DEVELOPMENT & INVESTMENT CO., LTD. OF NASSAU** (Phoenix-Rheinruhr, A.G., is part owner of the latter).
Plant site: Cartegena.
• Construction: A $13-million plant for production of 300 tons per day of ammonia and 150 tons per day of nitric acid is planned, with completion in 1961. Gas will come from IPC refinery, supplemented by naphtha. Ammonia to be used for making 225,000 tons of nitrogenous and mixed fertilizer.

SINTETICOS, S. A.
• Construction: Facilities for production of polyvinyl chloride.

FERTILIZANTES DE CENTRO AMERICA, S.A. (formed by private investors from Costa Rica, El Salvador, and Panama and International Development & Investment Co., Ltd. The latter is partly owned by Phoenix-Rheinruhr).
• Construction: Plans call for a plant to produce 180,000 tons per year of fertilizers with ammonia to come initially from International Petroleum's plant at El Salvador.

CZECHOSLOVAKIA

CZECHOSLOVAKIAN GOVERNMENT.
• Construction: Synthetic-rubber plant, with annual capacity of 30,000 metric tons when first half is completed in 1963.

SLOVNAFT-WORKS.
Plant site: Bratislava.
• Construction: Plant will produce petrochemical products including plastics and synthetic fibers.

DENMARK

IMPERIAL CHEMICAL INDUSTRIES (and two Danish companies, Dampskibsselskabet Svenborg and Dampskibsselskabet af 1912).
Plant site: Maersk near Copenhagen.
• Construction: Plans call for 15,000-ton per year plant for manufacture of polyolefins. Site will be near existing facilities at the Maersk refinery.

FORMOSA

CHINESE PETROLEUM CORP.
Plant: Kaohsiung.
Raw material: Refinery gas.
Product: 10 tons per day of sulfur.

FRANCE

ANTAR PETROLES DE L'ATLANTIQUE.
Plant: Donges.
Raw material: Aromatic and paraffinic hydrocarbons.
Products: Propylene, benzene, toluene, xylenes, and solvents.

AQUITAINE CHIMIE.
Plant: Lacq.
• Construction: Facilities for using methane for production of acetylene and ammonia.

AZOLACQ.
Plant site: Lacq.
• Construction: Facilities using ammonia for production of nitrogen fertilizers and urea.

BOZEL-NOBEL.
Plant: Port Jerome.
Raw material: Refinery gas.
Product: Sulfur.

CIE. FRANCAISE DE RAFFINAGE.
Plant: La Mede.
Product: Propylene.
Plant: Gonfreville.
Raw material: Light naphtha.
Products: Tetrapropylene, tripropylene, heptane, isobutylene, and ethylene (30,000 tons per year).

CIE. FRANCAISE DU CARBON BLACK, S. A. (Continental Carbon Co. and Phillips Petroleum Co.).
Plant site: Bec d'Ambes (Bordeaux).
• Construction: Carbon-black plant, with 25,000-metric-ton per year capacity, is set for completion late 1960.

ESSO STANDARD.
Plant: Port Jerome.
Raw material: Light naphtha.
Products: Ethylene, propylene, butadiene, isobutylene, tetrapropylene, tripropylene, and others.

ETHYLENE PLASTIQUE.
Plant: Mazingarbe.
Product: 22,000,000 lb. per year of high-pressure polyethylene.

ETHYLENE PLASTIQUES-NORMANDIE.
Plant: Port Jerome.
Product: 55,000,000 lb. per year of high-pressure polyethylene.

FIRESTONE TIRE & RUBBER CO.
Plant site: Port Jerome.
• Construction: Facilities for production of butadiene-styrene copolymers and synthetic latices. Project is in the planning stage.

KUHLMANN.
Plant: Paimboeuf.
Raw material: Fuel oil.
Product: Ammonia.

LORRAINE-DIEUZE.
Plant site: Moselle.
• Construction: Polyethylene facilities.

MANOLENE (Manufacture Normande de Polyethylene).
Plant: Gonfreville.
Raw material: Ethylene.
Product: 13,000,000 lb. per year of polyethylene.
• Construction: New facilities.

METHANOLACQ.
Plant: Lacq.
Raw material: Residual natural gas from Aquitaine Chimie plant at Lacq.
Product: Methanol (100 tons).

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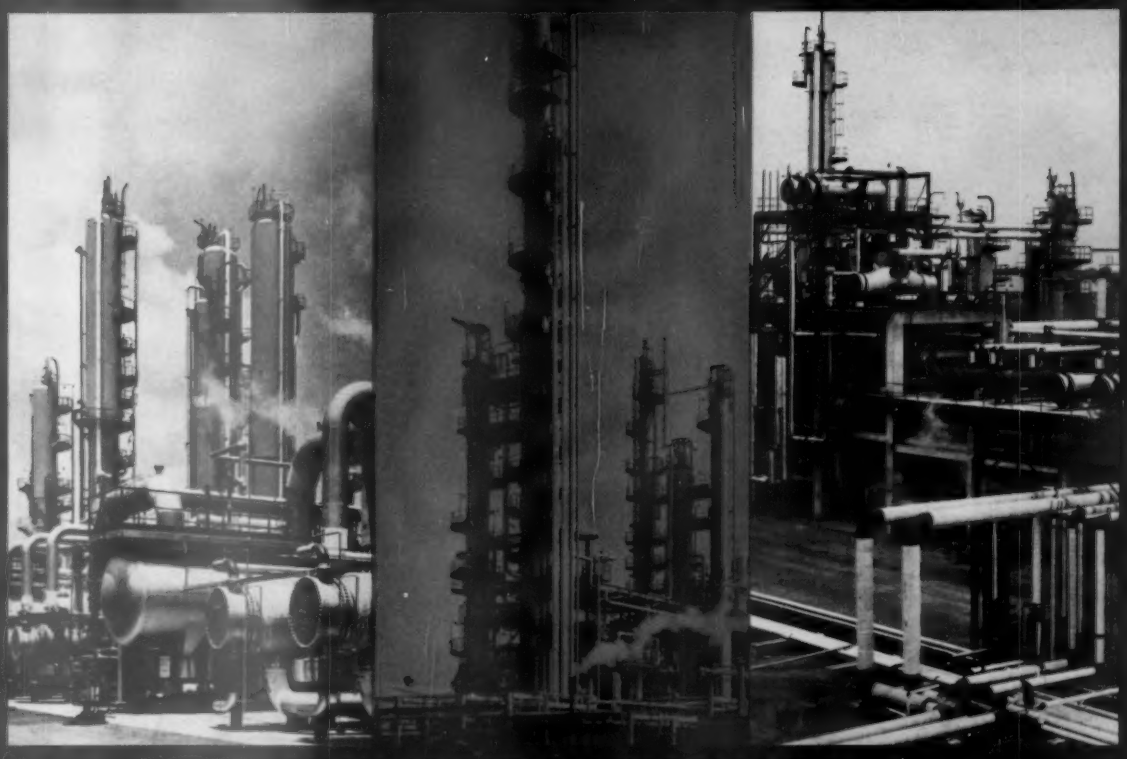

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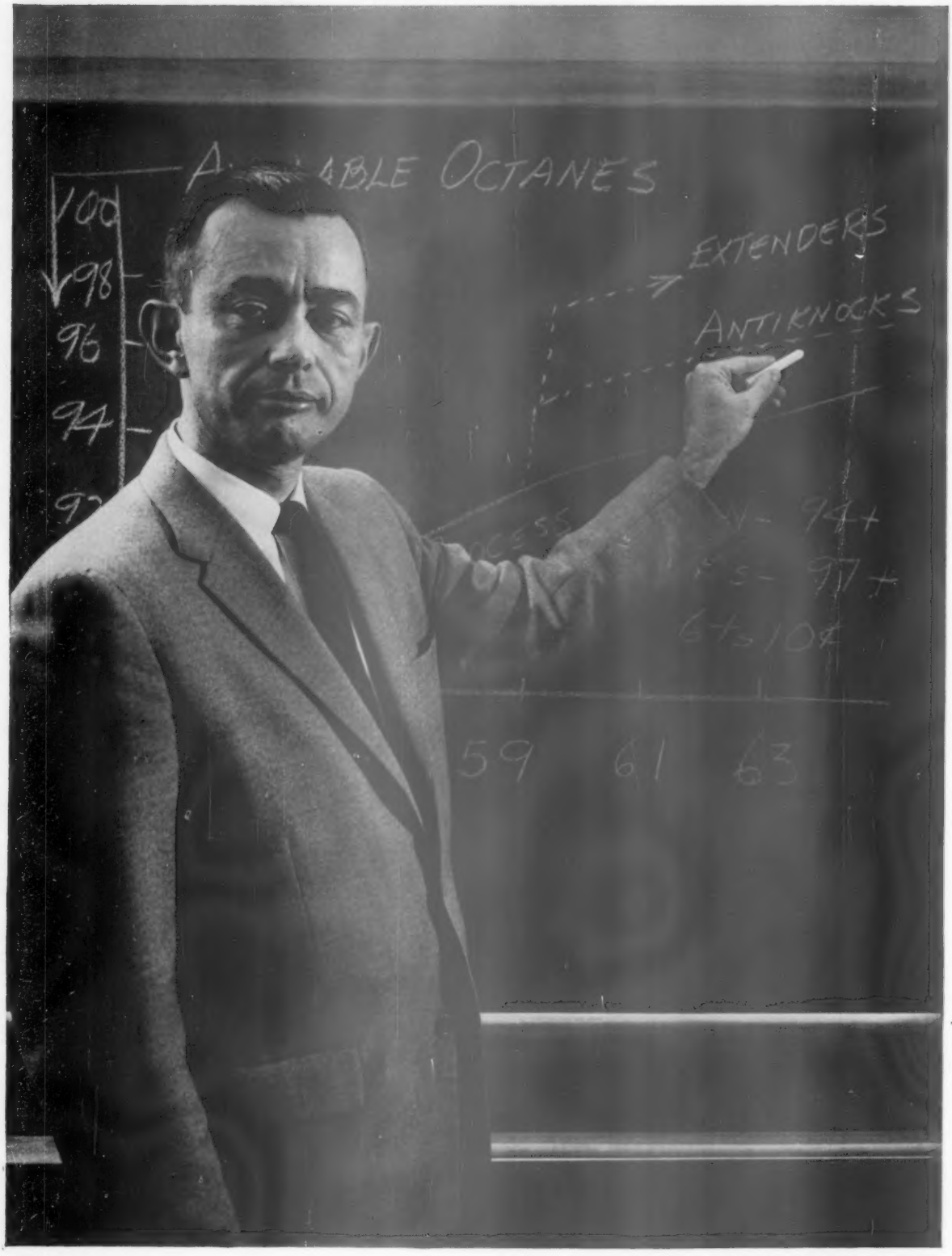
"Never before have the octanes offered



by additives been so important..."

T. W. Warren, Ethyl's Director of Refinery Technology, discusses how you can save by using the "additive octane" route.

"ADDITIVE OCTANES" are important in planning the most economical means for producing fuels to satisfy today's cars. And now is the time to study new additive potentials as you plan for the future. Antiknocks and extenders can supplement existing processing flexibility and provide a well protected but economical timetable for your product needs.

Additives an economical buy

However you control your quality—on a Research, Motor or Road octane basis—*antiknocks are the least expensive way to increase quality on a cost per octane basis* in nearly every refinery situation.

Furthermore, if lead is used to increase antiknock quality as measured by Research method, there is a substantial Road octane bonus as measured by current rating methods. Only antiknocks give this Road octane "extra."

Additives versus capital investment

Antiknocks have long provided refiners with the ability to meet needed octane increases almost overnight. That protection is greater now than in the past.

For the foreseeable future, the refining industry can meet all octane requirements with currently installed equipment and the additives now available. The need for capital investment may be delayed indefinitely, since "additive octanes" will provide a well-protected but economical cushion if there is a need for octane increases.

For premium grade fuels, antiknocks and extenders already available and others being developed—together with increases in octane available from installed processing equipment—assure you of ample quality for many years to come.

For regular grade fuels, the use of maximum TEL offers even greater protection. Additional octane quality is available from Ethyl's new antiknock compound, Motor 33 Mix. To this can be added quality improvement available from existing processing.

What about the future?

Research continues in the "additive octane" field. The future is certain to provide even greater choice and flexibility for the refiner.

For example, antiknocks are now being developed which may be used to great advantage in special applications to improve road performance. Several TEL extenders are also being studied. Some of these will eventually be commercially available.

Before you consider building new process equipment, we invite you to discuss with our technologists how "additive octanes" can be your best buy. Such a discussion may lead you to postpone additional capital investment in equipment for a long time. Call or write your Ethyl Representative to get all the details.

ETHYL ANTIKNOCK COMPOUND — ETHYL CORPORATION

ETHYL CORPORATION, NEW YORK 17, N. Y. • TULSA • CHICAGO • LOS ANGELES

ETHYL CORPORATION OF CANADA LIMITED, TORONTO • **ETHYL USA (EXPORT)** NEW YORK 17, N. Y.

NAPHTHACHIMIE.
Plant: Lavera.
Raw material: Naphtha and kerosine.
Products: Ethylene, propylene, butadiene, ethylene oxide (13,200,000 lb. per year), glycol (5,500,000 lb.), ethanolamines (5,500,000 lb.), glycol ethers and others (2,200,000 lb.), acetone (11,000,000 lb.), isopropanol (19,800,000 lb.), and Ziegler-type polyethylene (11,000,000 lb. per year).
• Construction: New 6,000-ton per year ethylene oxide plant scheduled for completion in 1960. New butadiene plant, with capacity of 6,000 to 7,000 tons, is planned. New propylene facilities are scheduled for completion early 1961.

OFFICE NATIONAL INDUSTRIEL DE L'AZOTE.
Plant: Toulouse.
Raw material: Heavy fuel oils.
Products: Acetylene, ammonia, and methanol.

ORONITE CHEMICAL CO. and STE. CALIFORNIE-ATLANTIQUE (Antar Petroles de l'Atlantique and Ste. Progil).
Plant site: Donges.
• Construction: New facilities to make 8,500 tons per year of para-xylene from feed stocks from Antar refinery scheduled for completion late 1960.

PECHINEY.
Plant: St. Auban.
Raw material: Propane.
Products: Perchlorethylene and carbon tetrachloride.
• Construction: Polypropylene will be produced under license agreement signed with Montecatini. Plant will have capacity of 2,000,000 lb. per year.

PIERREFITTE.
Plant: Pierrefitte.
Raw material: Natural gas.
Product: Ammonia.

PLASTICHIMIE, S. A. (Pechiney and Dow Chemical International).
Plant site: Ribecourt near Paris.
• Construction: Polystyrene and vinylidene chloride copolymer plant, with completion expected in 1961.

POTASSE ET ENGRAIS CHIMIQUES.
Plant: Grand Couronne.
Product: Ammonia.

REICHHOLD CHEMICALS, INC.
Plant: Niort.
• Construction: New plant to produce 73,000 tons per year of formaldehyde.

ST. GOBAIN.
Plant: Balaruc.
Raw material: Refinery Gas.
Product: Sulfur.
Plant: Port de Bouc.
Raw material: Refinery gas.
Product: Sulfur.

SHELL-ST. GOBAIN.
Plant: Berre.
Raw materials: Propylene, butylene, and heavy cracked residuals.
Products: Isopropanol, diacetone, alcohol, butyl acetone, epoxy resins, carbon black, base materials for detergents, and an expanded range of organic solvents.
Plant: Petit Couronne.
Raw material: C_8-plus kerosine.
Product: Alkyl sulfate of soda for use in detergents.

SIDA.
Plant: La Chambre.
Raw material: Isopropanol and secondary butanol.
Products: Diacetone alcohol, acetone, and methyl-ethyl ketone.
Plant site: Notre-Dame de Gravenchon.
• Construction: Plant for manufacture of butanol.

STE. ATLANTIQUE PROGIL ELECTROCHIMIE.
Plant: Donges.
Raw material: Propylene and benzene.
Product: Cumene.

STE. CABOT-FRANCE.
Plant: Berre.
Product: Carbon black.

STE. CHIMIQUE DE LA GRANDE PAROISSE.
Plant: Grand Quevilly.
Raw material: Refinery gas.
Product: Ammonia.

STE. DE PRODUITS CHIMIQUES COURRIERES-KUHLMAN.
Plant: Harnes.
Raw materials: Dimers of butylene and propylene, and trimers of propylene.
Product: Dodecylbenzene and oxo alcohols.

STE. DE PRODUITS CHIMIQUES MARLES-KUHLMANN.
Plant: Chocques.
Raw material: Propylene.
Products: Propylene oxide and derivative for use in polyester resins.
Plant site: Gonfreville.
• Construction: Facilities for ethylene oxide and derivatives.

STE. D'ELECTROCHIMIE, D'ELECTROMETALLURGIE ET DES ACIERES ELECTRIQUES D'UGINE.
Plant site: Villers St. Sepulchre.
• Construction: Facilities for production of latex rubber, using butadiene and styrene as raw material.

STE. DES ELASTOMERS DE SYNTHESE (owned by Shell-St. Gobain, Texas Butadiene & Chemical Corp., and several tire-manufacturing companies).
Plant site: Berre.
• Construction: New plant with capacity of 50,000 tons of SBR per year will be completed in 1961.

STE. DES USINES CHIMIQUES RHONE-POULENC.
Plant: Peage de Roussillon.
Raw materials: Propylene, benzene, and cumene.
Products: Cumene, acetone, and phenol.

STE. DU CAOUTCHOUC BUTYL.
Plant: Port Jerome.
Raw material: Isobutene.
Products: 20,000 tons per year of butyl rubber.

STE. NATIONALE DES PETROLES D'AQUITAINE.
Plant: Lacq.
Raw material: Natural gas.
Products: Ethylene and sulfur.
• Construction: Facilities for acetylene, methanol, and ammonia. Another 1,000-ton per day sulfur unit will be built soon, giving the plant total capacity of 4,000 tons.

STE. NORMANDE DE MATIERES PLASTIQUES.
• Construction: Polyethylene will be produced by this company at a plant with capacity of 20,000,000 lb. per year. This company also has an agreement with Montecatini to produce polypropylene.

STE. PETROSYNTHESE.
Plant: Gonfreville.
Raw material: Benzene and tetrapropylene.
Product: Dodecylbenzene.

STE. PROGIL-ELECTROCHIMIE.
Plant: Pont de Claix.
Raw material: Cumene.
Products: Acetone and phenol.
• Construction: New plant to make perchlorethylene and carbon tetrachloride.

STE. RHODIACETA (subsidiary of Rhone-Poulenc).
Plant site: Lyon.
• Construction: One of the largest hydrogen plants in Europe will be built here, with construction by Chemical Construction, Ltd. Capacity will be 2,500 M.c.f. per day of hydrogen gas from reformed natural gas from Lacq.
Plant site: St. Fons.
• Construction: New facilities to produce terephthalates from para-xylene and ethylene glycol.

STE. STANDARD-KUHLMANN.
Plant: L'Estane.
Raw material: Aromatic alkyls.
Product: 19,800,000 lb. per year of detergents.

STE. VINYLACQ (company formed by Pechiney, St.-Gobain, and Banque de Paris et des Pays-Bas).
Plant site: Lacq.
• Construction: Plant for manufacture of vinyl chloride is planned.

UNITED CARBON CO., INC.
• Construction: A $5-million carbon-black plant with initial rated capacity of 50,000,000 lb. per year is scheduled for completion early in 1961.

UGILOR.
• Construction: Ugilor has an agreement for use of Distillers Co.'s patents for making acrylonitrile from propylene and ammonia at a plant to be built by Ugilor.

GERMANY (East)

EAST GERMAN GOVERNMENT.
• Construction: A 40,000-ton per year ethylene plant has been ordered from two British companies: Petrocarbon Developments, Ltd., and Humphreys & Glasgow, Ltd. First phase is expected to be completed in December 1962.
Plant site: Schwedt/Oder.
• Construction: New plant, supplied with crude from Poland and Russia, will be on stream in 1963.

DIA CHEMIE
Plant site: Leuna.
- Construction: $12-million plant for production of 300,000 lb. of ethylene aromatics is planned, with probable completion in 1962.

GERMANY (West)

BADISCHE ANILIN & SODA-FABRIK.
Plant: Ludwigshafen.
Raw material: Crude oil.
Products: Styrene, polyethylene, methanol, isopropanol, and acetone.

B. P. BENZIN UND PET, A.G.
Plant: Dinslaken.
- Construction: Ethylene facilities.

BUNA WERKE HULS, G.M.B.H.
Plant: Marl.
Products: Butadiene, styrene, copolymer, and synthetic rubber.
- Construction: Expanding capacity from 70,000 to 120,000 tons per year.

CARBOSUF CHEMISCHE WERKE, G.M.B.H. (joint subsidiary of Glanzstoff Courtaulds, G.m.b.H., and Dr. Jacob, Chemische Fabrik).
Plant site: Cologne-Weidenpesch.
- Construction: This company is building a carbon disulfide plant with capacity of 50,000 tons per year, using raw materials from refineries in the Cologne area. Completion is expected by the beginning of 1962.

CHEMISCHE WERKE HOLTEN.
Plant: Oberhausen.
Products: Ethylene oxide and glycol. Capacity estimated at 44,000,000 lb. per year.

CHEMISCHE WERKE HUELS.
Plant: Marl.
Raw material: Natural gas, LPG, and coal gas for acetylene plant which is the base for most of the operations.
Products: Ethylene, polyethylene, ethanol, styrene (160,000,000 lb. per year), ethylene oxide, cumene, and dodecylbenzene.

DEUTSCHE ERDOL-AKTIENGESELLSCHAFT.
Plant: Heide, Holstein.
Products: Ethylene (2,000,000 lb. per year), propylene (18,000,000 lb. per year), and sulfur (5,300,000 lb. per year).
- Construction: New facilities to produce 11,000,000 lb. per year of isobutylene scheduled to start production in 1961.

DEUTSCHE SHELL.
Plant: Near Cologne.
Raw material: Refinery gases.
Product: Ethylene, used at adjacent plant of Rheinische Olefinwerke.

ERDOLCHEMIE, G.M.B.H. (Farbenfabriken Bayer and British Petroleum).
Plant: Dormagen near Cologne.
Raw material: Refinery feed stocks.
Products: Benzene, ethylene, ethylene glycol, propylene oxide, ethylene oxide (79,300,000 lb. per year), propylene, butylene, butadiene, and ethanol (40,000,000 lb. per year).
- Construction: In 1961, the company expects to be making n-butylenes and di-eso and tri-isobutylenes.

ESSO, A.G.
Plant: Cologne.
Raw material: Refinery feed stocks.
Products: Ethylene, propylene (35,000 tons per year), butadiene (7,500 tons per year), isomeric butylene, methane, hydrogen, tetra-propylene, and acetylene.
- Construction: Expansion expected to be completed June 1961.

Plant: Hamburg-Harburg.
Raw material: Refinery gas.
Products: Butadiene and propylene.

FARBENFABRIKEN BAYER.
Plant: Leverkusen.
Products: Rubber and fibers.

FARBWERKE HOECHST, A.G.
Plant: Gendorf.
Raw material: Refinery feed stocks and natural gas.
Products: Ethylene oxide and glycol, other glycols and derivatives, detergents, nylon, emulsifiers, lacquers, antifreeze compounds, textile and agricultural chemicals, polyvinyl chloride, polypropylene and other plastics, and methane chlorination products.
Plant: Hoechst.
Raw material: Petroleum distillates.
Products: Ethylene, propylene, ethanol, isopropanol, acetone, low-pressure polyethylene, polypropylene, polyvinyl acetate, and fibers and films.
- Construction: New ethylene and acetylene plants under construction. When completed, olefin capacity will be an estimated 130,000,000 lb. per year.

Plant: Hamburg-Harburg.
Raw materials: Refinery gas.
Products: Butadiene and propylene.

HIBERNIA.
Plant: Herne.
Products: Ethylene and polypropylene.

KOHLE-OEL-CHEMIE.
Plant: Gelsenkirchen.
Product: Polyethylene.

ORONITE CHEMICAL and **BP.**
- Construction: Plans call for new facilities to produce p-xylene, o-xylene, benzene, and ethyl benzene.

PHENOL CHEMIE.
Plant: Gladbeck.
Products: Phenol and acetone.

REICHHOLD CHEMIE (joint venture by Reichhold and Deutsche Erdol, Hamburg independent refiner).
Plant: North Sea port of Brunsbuettelkoog.
- Construction: Facilities for making petrochemical raw materials is expected to begin production in 1961.

RHEINISCHE OLEFINWERKE, G.M.B.H. (owned 50% by Shell and 50% by Badische Anilin & Soda-Fabriken).
Plant: Wesseling near Cologne.
Raw materials: Refinery gases and light naphthas.
Products: Ethyl benzene (12,000 tons per year), epoxy resins (2,000 tons), ethylene (102,000,000 lb. per year), high-pressure polyethylene (35,000 tons), and low-pressure polyethylene (6,000 tons per year).
- Construction: Expanding ethylene capacity to an estimated 275,000,000 lb. per year by 1962, and polyethylene capacity correspondingly.

RHEINPRUESSEN.
Plant: Homberg.
Products: Dodecylbenzene, ethanol, acetone, butyl alcohols, isopropanol, alky phenols, diisobutylene, oxo-alcohols, methyl isopropyl ketone, phthalic anhydride, triisobutylene, methyl ethyl ketone, ethyl amyl ketone, and plastics.

ROHM & HAAS.
Plant: Darmstadt.
Product: Acrylic and methyl-acrylic resins.

RUHRCHEMIE.
Plant: Oberhausen.
Products: Polyethylene and styrene.

SCHOLVEN-CHEMIE, A.G.
Plant: Near Gelsenkirchen.
- Construction: Low-pressure polyethylene plant.

UNION RHEINISCHE BRAUNKOHLEN-KRAFTSTOFF, A.G.
Plant: Wesseling near Cologne.
Raw material: Refinery feed stocks and Rhine coal.
Products: Ammonia, methanol, and 25,000 tons per year of urea.

WACKER CHEMIE
Plant: Burghausen.
Products: Trichloroethylene and vinyl acetate.

GREECE

DOW CHEMICAL CO.
- Construction: Polystyrene plant is being built at cost of more than $1 million. The plant will use imported raw materials. It will be the first such plant for Greece. Completion is scheduled end of 1961.

HUNGARY

HUNGARIAN GOVERNMENT.
- Construction: Recent reports on construction include: 15,000-ton per year polyvinyl chloride plant by Borsod Chemical Combine; a 10,000-ton per year polyethylene installation by Tiszavidek Chemical Enterprise; a 100,000-ton per year nitrogenous fertilizer plant and two 100,000-ton per year sulfuric acid units at the Tiszapalkonya plant; and an increase in fertilizer capacity at the Kazincbarcika plant where feed stock will be changed from coke to natural gas.

INDIA

ALKALI & CHEMICAL CORP. (subsidiary of Imperial Chemical Industries).
Plant: West Bengal.
Product: 3,500 tons per year of polyethylene.

INDIA GOVERNMENT.
- Construction: Proposals by the Indian Government include a 70,000-ton per year nitrogenous fertilizer plant and a 53,000-ton per year phosphate fertilizer plant at Mysore. A 500-ton per day urea plant is also expected by 1963.

NATIONAL CARBON INDIA.
Plant: Near Bombay.
Product: Polyethylene.

SYNTHETICS & CHEMICALS, LTD. (formed by Firestone Tire & Rubber Co. and Kilechand Devchand & Co. Private, Ltd.).
Plant site: Bareilly.
- Construction: Facilities to produce 20,000

tons per year of styrene, butadiene, and copolymer. Part of the raw material will be petrochemical, including ethylene and petroleum benzene for styrene production. Sugar and alcohol will reportedly provide raw material for butadiene. Project is in the planning stage.

UNION CARBIDE INTERNATIONAL CO.
Plant site: Bombay.
- Construction: Scheduled for completion in 1960 are facilities to make acetaldehyde, acetic acid, butanol, and polyethylene.

INDONESIA

INDONESIAN GOVERNMENT.
Plant site: Near Palembang, Sumatra.
- Construction: A $30-million ammonia plant scheduled for completion in 1962. It will produce 330 tons daily of fertilizer-grade prilled urea. Raw material will be natural gas from Standard Vacuum's Radja field. Financing will be in part through the Export-Import Bank. Foster Wheeler has construction contract.

IRAN

IRANIAN GOVERNMENT.
Plant site: Shiraz.
- Construction: Capacity of new nitrogen-fertilizer plant will be 110 tons per day. ENSA CO. (France) is general contractor for the nitric acid and ammonium nitrate plant.

MONTECATINI.
Plant site: Ahwaz.
- Construction: Plans call for a polyvinyl chloride plant based on gas from Agha Jari field to go on stream in 1961. Capacity will be 4,000 metric tons per year.

IRAQ

IRAQ GOVERNMENT.
Plant site: Basrah area.
- Construction: Fertilizer plant planned here, using natural gas as raw material.

ISRAEL

ISRAEL GOVERNMENT.
Plant site: Haifa.
- Construction: An ethylene plant is being installed at the Haifa refinery. A deal has also reportedly been signed between Israel and private investors calling for a $5-million polyethylene plant.

ITALY

ABCD.
Plant: Ragusa, Sicily.
Raw material: Crude from nearby wells.
Products: Ethylene, high-pressure polyethylene (25 tons per day), propylene, butylene, and derivatives.

ANIC.
Plant: Ravenna.
Raw material: Methane and refinery butane.
Products: Ammonia, nitrogen fertilizer (750,000 tons per year), acetylene, butadiene for synthetic rubber (60,000 tons per year), styrene monomer, and ethylene.
- Construction: Facilities for production of ethylene.

Plant site: Gela, Sicily.
- Construction: In planning stage is a petrochemical plant based on local crude.

APPLICAZIONI CHIMICHE SOCIETA AZIONI.
Plant: Milan.
Product: Synthetic fibers.

AZIENDA COLORI NAZIONALI AFFINI.
Plant: Cengio.
Product: 22,000,000 lb. per year of phthalic anhydride.

COLUMBIAN CONTINENTAL EUROPA.
Plant: Trecate.
- Construction: A $6-million plant to produce 60,000,000 lb. per year of carbon black will be completed fall 1960.

CYANAMID-ITALIA.
Plant site: Catania, Sicily.
- Construction: Plans call for new chemical facilities.

DISTILLERIE ITALIENNE.
Plant site: Milan.
- Construction: A butanol plant with 11,000-ton per year capacity.

DOW CHIMICA ITALIANA, S.P.A. (formed by Dow Chemical International).
Plant site: Somewhere in Italy.
- Construction: This new company plans a multimillion-dollar plant in Italy.

ENI.
Plant site: Ferrandina.
- Construction: $64-million petrochemical plant is planned, based on natural gas.

Plant site: Southern Sicily.
- Construction: Plans call for refinery and petrochemical facilities based on crude from Gela. Size of plant will be scaled to capacity of the field.

FTALITAL, S.P.A.
Plant site: Somewhere in Italy.
- Construction: A plant with capacity of 2,200,000 lb. per year of maleic anhydride is planned.

MONTECATINI.
Plant: Castellanza.
Product: Formaldehyde.
- Construction: Expansion of facilities reportedly under way.

Plant: Ferrara.
Raw material: Methane, liquid hydrocarbons, and refinery gases.
Products: Ethylene (30,000 metric tons per year), propylene (15,000 tons per year), ammonia, and polypropylene.
- Construction: Plans reportedly call for expansion of polypropylene facilities.

Plant: Novara.
Raw material: Methane.
Products: Ammonia, methyl alcohol, and acetylene.

Plant: Priolo, Sicily.
Raw material: From Rasiom refinery at Augusta.
Product: Ammonia.

Plant site: Brindisi.
- Construction: Work under way at a $95-million petrochemical complex, one of the largest in Europe. At least 1,300,000 tons of raw material will be used annually for production of ethylene-propylene and ethylene-butylene copolymers (20,000 tons per year), polyethylene, isotactic polypropylene, polymers for synthetic fibers, aldehydes, alcohols, and organic solvents. Completion scheduled 1962. The company has a sizable polybutene-1 pilot plant at Brindisi and is planning commercial facilities.

Plant site: Terni.
- Construction: New plant with capacity of 10,000,000 lb. per year of polypropylene staple fiber and continuous thread.

PHILLIPS CARBON BLACK ITALIANA, S.P.A. (owned by Phillips Petroleum Co. and ANIC).
Plant site: Somewhere in Italy.
- Construction: Plans to build a plant to produce 25,000,000 lb. per year of carbon black, with completion by January 1, 1962.

SHELL ITALIANA.
Plant site: Rho refinery near Milan.
- Construction: Adding facilities for fractionation and extraction of 100,000 tons per year of aromatic solvents. Completion set for mid-1961.

SICEDISON.
Plant: Marghera.
Raw material: Methane.
Products: Ammonia, acetylene, and acetic and vinyl derivatives.

Plant: Mantua.
Raw material: Liquid hydrocarbons and refinery gases.

SINCAT (Industriale Catonese and Cia. Edison affiliate).
Plant: Syracuse, Sicily.
Raw material: From Rasiom refinery at Augusta.
Products: Olefins, especially ethylene and propylene.

Plant: Priolo, Sicily.
Product: Ethylene and ammonia (240 metric tons per day).

SIRE.
Plant site: Porto Torres, Sardinia.
- Construction: New plant for ethylene, propylene, ethanol, and propylene tetramer production.

Plant: Milan.
Raw material: Methane.
Products: Acetylene and acetic derivatives.

Plant: Varese.
Products: Propylene tetramer and cumene-phenol.

SNIA VISCOSA.
Plant site: Near Milan.
- Construction: New carbon disulfide plant, using natural gas. Completion due in 1960. Products will be used to manufacture rayon.

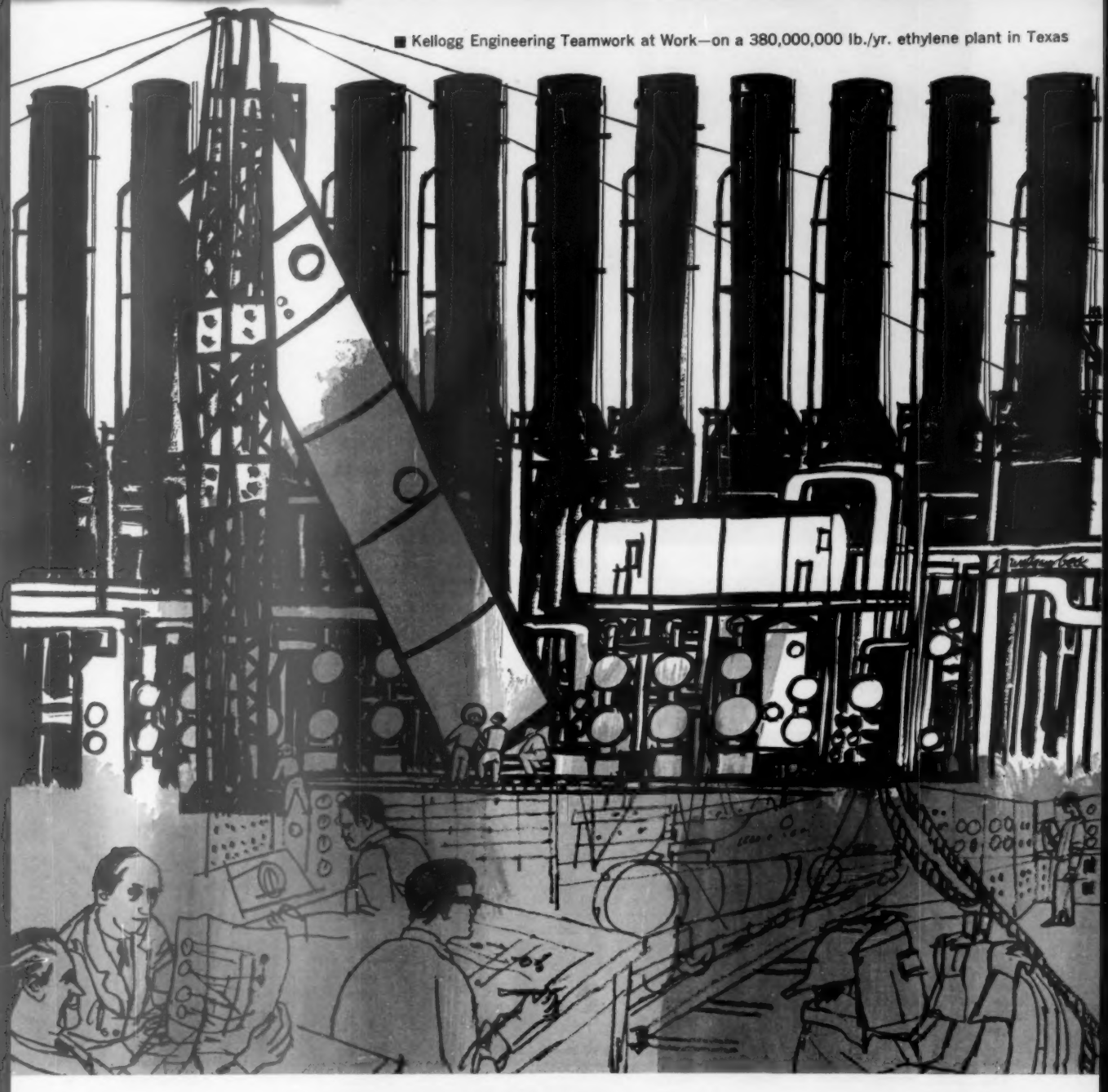
SOC. CABOT ITALIANA (an affiliate of Cabot Laboratories, Boston).
Plant: Ravenna.
Product: 14,000 tons per year of carbon black.

SOC. CHIMICA RAVENNA (associated with ANIC).
Plant: Ravenna.
Products: Vinyl chloride.

S.P.A. CELENE (owned jointly by Union Carbide and Soc. Edison).
Plant: Near Priolo, Sicily.
Products: Polyethylene, ethylene oxide and derivatives (capacity of plant is 25,000 tons per year).
- Construction: Plans call for new facilities for production of propylene oxide and derivatives.

VETROCOKE.
Plant: Marghera.
Raw material: Methane.
Product: Ammonia.

■ Kellogg Engineering Teamwork at Work—on a 380,000,000 lb./yr. ethylene plant in Texas



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Working with clients on this basis, Kellogg has been responsible for a variety of chemical plants throughout the world. In the United States, current projects include: a 380,000,000 lb./yr. ethylene plant in Texas; an 18,000,000 lb./yr. epichlorohydrin plant in New Jersey; a 300 ton/day ammonia plant in Missouri; a 200 ton/day urea plant in Delaware.

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THIS JAPANESE PLANT is symbolic of the fast-moving development of new petrochemical facilities in that country, where 25 construction projects are currently under way or planned. In the past 5 years alone, $228 million has been poured into new facilities. The photo shows Japan Synthetic Rubber Co.'s recently completed butadiene plant at Yokkaichi, with current capacity of 40,000 tons per year of SBR.

JAPAN

ASAHI DENKA KOGYO K.K.
Plant: Tokyo.
Raw material: Propylene.
Product: 2,400 tons per year of propylene glycol.

ASAHI-DOW, LTD.
Plant: Kawasaki.
Raw material: Ethlyene and benzene.
Product: 18,000 tons per year of styrene monomer.
- Construction: Planning to increase capacity to 36,000 tons per year in 1962. This company has also signed with Standard Oil Co. to produce 15 tons per day of acrylonitrile by 1961.

FURUKAWA CHEMICAL INDUSTRIES CO., LTD.
Plant: Kawasaki.
Raw material: Ethylene.
Product: 9,000 tons per year of polyethylene.

JAPAN CATALYTIC CHEMICAL IND. CO., LTD., (owned mainly by Sumitomo Group).
Plant: Kawasaki.
Raw material: Ethylene and o-xylol.
Products: Ethylene oxide (1,800 tons per year), ethylene glycol (3,800 tons), and phthalic anhydride (30,000 tons).

JAPAN GEON CO., LTD., (owned by Furukawa Group and 35% by B.F. Goodrich).
Plant: Kawasaki.
Raw material: Butadiene and styrene monomer.
Products: SBR (3,600 tons per year), high styrene rubber (2,400 tons), and NBR (2,400 tons).
- Construction: The above output will be increased to total of 30,000 tons per year by 1962. Also, 72,000 tons per year of vinyl chloride will be produced from petroleum-derived acetylene after 1962.

JAPAN SODA CO., LTD.
Plant: Nihongi, Niigata Prefecture.
Raw material: Ethylene.
Product: 2,400 tons per year of ethylene oxide.
- Construction: Planning to produce 3,600 tons per year of polypropylene glycol by 1962.

JAPAN SYNTHETIC RUBBER CO., LTD., (40% owned by the government and 12% by Bridgestone Tyre Co.).
Plant: Yokkaichi.
Raw material: Butane, styrene, and butadiene.
Products: SBR (40,000 tons per year) and SBR latex (5,000 tons).
- Construction: Planning to increase the present capacity and add new products as follows: carbon master batch (13,000 tons per year) in 1961, butyl rubber (10,000 tons) in 1964, SBR (additional 40,000 tons) in 1963, polybutadiene (20,000 tons) in 1964, SBR latex (additional 10,000 tons) in August 1960.

KURASHIKI RAYON CO., LTD.
Plant site: Mizushima, Okayama Prefecture.
- Construction: Scheduled to go on stream by 1963 is a $9-million plant, with another plant to go on stream by 1965. Initial production will be 23 tons of vinylon daily.

KYOWA FERMENTATION INDUSTRY CO., LTD.
Plant site: Ube, Yamaguchi Prefecture.
- Construction: Planning to produce acetaldehyde (61,500 tons per year), octanol (15,000 tons), n-butanol (25,000 tons), and acetone (25,300 tons) from naphtha cracking.

MARUZEN OIL CO., LTD.
Plant: Matsuyama, Shikoku.
Raw material: Refinery gas and naphtha.
Products: Benzene (6,420 tons per year), toluene (6,000 tons), xylene (9,600 tons), and terephthalic acid (9,000 tons).
- Construction: Terephthalic acid will be increased to 18,000 tons per year. Also, plans call for adding benzoic acid (900 tons per year), phthalic acid anhydride (2,000 tons), and isophthalic acid (5,000 tons).

Plant: Shimotsu, Wakayama Prefecture.
Raw material: Refinery gas and naphtha.
Products: Sec-butanol (2,400 tons per year), MEK (1,900 tons), and alkylphenol (2,400 tons).
- Construction: To increase capacity to 4,800 tons per year of sec-butanol, and 6,200 tons per year of MEK.

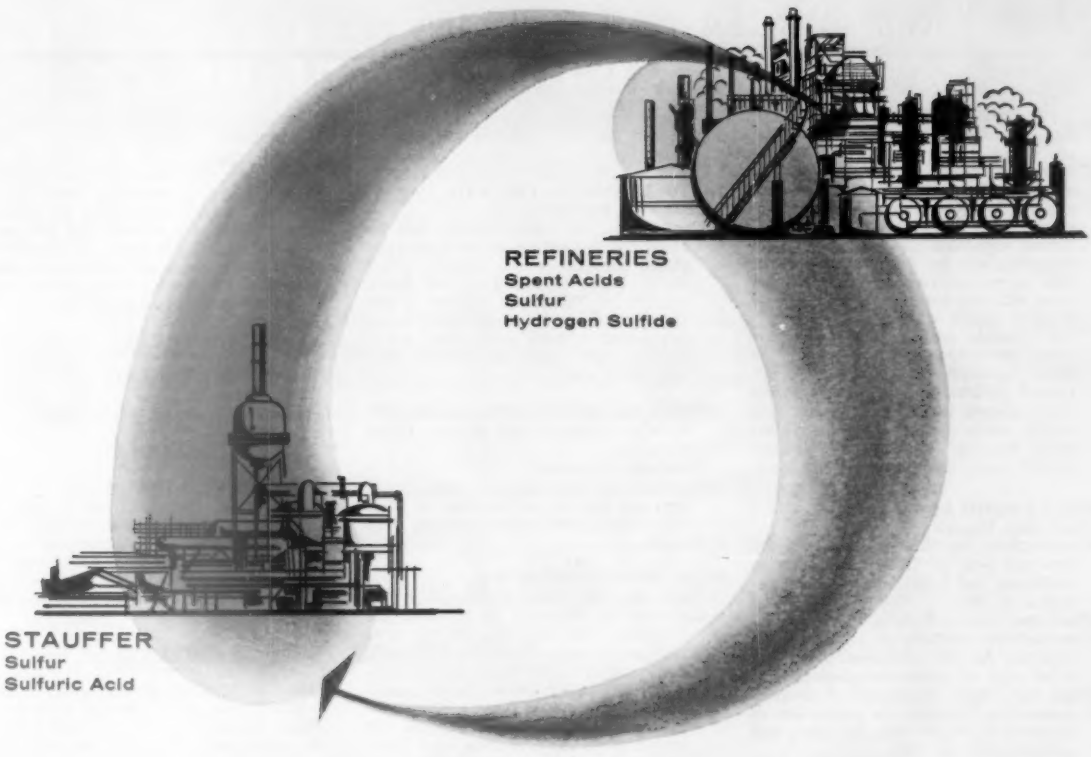
Plant site: Goi, Chiba Prefecture.
- Construction: Planning to produce higher alcohol (20,000 tons per year), polybutene (5,000 tons), MEK (8,000 tons), nonene, dodecylbenzene, and butanol.

MIIKE SYNTHETIC CO., LTD.
Plant site: Omuta, Kyushu.
- Construction: Planning to produce 3,600 tons per year of maleic anhydride.

MITSUBISHI MONSANTO CHEMICAL CO. (owned by Mitsubishi Kasei and Monsanto Chemical Co.).
Plant: Yokkaichi.
Product: 1,800 tons per year of polystyrene.
Plant: Nagoya.
Product: 9,600 tons per year of plastics.

MITSUBISHI OIL CO., LTD., (owned by the Mitsubishi Group and 50% by Tidewater Oil Co.).
Plant: Kawasaki.
Raw material: Platformate.
Products: Benzene (4,700 tons per year), toluene (3,500 tons), and xylene (3,000 tons).
- Construction: Plans call for facilities for various dibasic acids, such as benzoic acid, phthalic anhydride, isophthalic acids.

MITSUBISHI PETROCHEMICAL CO., LTD.
Plant: Yokkaichi.
Raw material: Refinery gas and naphtha.
Products: Polyethylene (10,000 tons per



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year), styrene monomer (18,000 tons), ethylene oxide (5,000 tons), and ethylene glycol (3,000 tons).

- Construction: Stone & Webster Engineering Corp. has contract for design and assisting in engineering and construction of a second ethylene plant, with completion scheduled mid-1962. Additional capacities will be: polyethylene (50,000 tons per year), styrene monomer (29,000 tons), ethylene oxide (12,000 tons), and ethylene glycol (7,500 tons). Further, the following products are planned by 1962: polypropylene (10,000 tons per year), dodecylbenzene (10,000 tons), phenol (13,000 tons), bisphenol (5,000 tons), acetone (8,000 tons), epoxy resin (4,000 tons), petroleum resin (4,000 tons), benzene (13,000 tons), toluene (14,000 tons), and xylene (11,000 tons).

MITSUI CHEMICAL CO., LTD.
Plant site: Nagoya.
- Construction: Facilities to produce 3,600 tons per year of D-D, 6,000 tons of bisphenol, and 5,000 tons of epichlorohydrin in 1961.

Plant site: Omuta, Kyushu.
- Construction: Facilities to produce 1,200 tons per year of propylene glycol and 1,200 tons of pentachlorophenol.

Plant site: Otake, Yamaguchi Prefecture.
- Construction: Facilities for production of acrylonitrile (7,200 tons per year) and polypropylene in 1962.

MITSUI PETROCHEMICAL CO., LTD.
Plant: Iwakuni, Yamaguchi Prefecture.
Raw material: Refinery gas, naphtha, and platformate.
Products: Polyethylene (12,000 tons per year), ethylene glycol (9,600 tons), ethylene oxide (12,000 tons), phenol (12,000 tons), acetone (7,000 tons), benzene (8,760 tons), toluene (11,220 tons), and xylene (11,220 tons).
- Construction: Planning to produce the following in 1962: terephthalic acid (21,000 tons per year), styrene monomer (12,000 tons), acetaldehyde (24,000 tons), polystyrene (6,000 tons), acrylonitrile (10,800 tons), and MIBK (6,000 tons).

MITSUI PETROCHEMICAL-DU PONT CO. LTD., (owned 50% by Mitsui Petrochemical and 50% by Du Pont).
Plant site: Otake, Yamaguchi Prefecture.
- Construction: Planning to produce 24,500 tons per year of polyethylene in 1962.

NIPPON PETROCHEMICAL CO., LTD.
Plant: Kawasaki.
Raw material: Propane and naphtha.
Products: Isopropanol (4,000 tons per year), acetone (4,500 tons), ethylene (30,000 tons), propylene (23,000 tons), and butadiene (5,200 tons).
- Construction: Planning to increase ethylene capacity to 40,000 tons per year, propylene to 42,000 tons, and butadiene to 10,200 tons in 1962. New products planned in 1961 include benzene (16,300 tons per year), toluene (9,100 tons), xylene (3,800 tons), dodecylbenzene (10,000 tons), and polypropylene (10,000 tons).

NIPPON PETROLEUM DETERGENT CO., LTD. (owned by Nippon Petrochemical Co., Ltd., and 45% by Oronite Chemical Co.).
Plant site: Kawasaki.
- Construction: Scheduled for completion by late 1961 is a polymer and alkylate plant.

NITTO CHEMICAL CO., LTD.
Plant site: Kawasaki.
- Construction: In 1961, facilities will be ready for production of ethlyene oxide (6,000 tons per year), ethylene glycol (6,000 tons), n-butanol (11,000 tons), acrolein (1,200 tons), ethanol amine (1,600 tons), ethyl diamine (1,200 tons), hexamethyl diamine (3,600 tons), acrylonitrile (2,800 tons), and sodium cyanide (2,400 tons).

NITTO UNICAR CO., LTD., (owned 50% by Nitto Chemical and 50% by Union Carbide).
Plant site: Kawasaki.
- Construction: Planning to produce 27,000 tons per year of polyethylene in 1962. Toa Nenryo will supply ethylene feed stock.

SHIN NIPPON CHISSO K.K.
Plant site: Goi, Chiba Prefecture.
- Construction: Planning to produce the following: acetaldehyde (30,000 tons per year), acetic acid (10,000 tons), ethyl acetate (6,000 tons), octanol (10,000 tons), DOP/DOA (24,000 tons), decyl alcohol (6,000 tons) and polypropylene (11,000 tons). Maruzen Oil will supply ethylene, propylene, and butylene feed stock. AviSun's technical assistance is proposed in the manufacture of polypropylene.

SHOWA DENKO K.K.
Plant: Kawasaki.
Raw material: Propylene.
Products: Propylene glycol (3,600 tons per year) and propylene oxide (3,600 tons).
- Construction: Polypropylene (10,000 tons per year), vinyl chloride (22,000 tons), phthalic anhydride (3,600 tons), neoprene (8,000 tons), acetaldehyde (15,000 tons), and oxo alcohol (6,000 tons). Phillips Petroleum Co. is designing a 5,000-ton per year carbon-black plant for this company, using Phillips' process for making oil furnace black. It should be in operation by 1961.

SHOWA PETROCHEMICAL CO., LTD.
Plant, Kawasaki.
Raw material: Ethlyene.
Product: 10,000 tons per year of polyethylene.
- Construction: Planning to increase polyethylene production to 20,000 tons per year by 1962.

SUMITOMO CHEMICAL CO., LTD.
Plant: Niihama, Shikoku.
Raw material: Naphtha.
Products: Polyethylene (11,000 tons per year), acrylonitrile (6,100 tons), and prussic acid (3,600 tons).
- Construction: Planning for 1962 through 1965: polyethylene (increased to 65,000 tons per year), polypropylene (20,000 tons), oxo alcohol (10,000 tons), propylene glycol (4,000 tons), acrylonitrile (increased to 16,100 tons). Agreement signed with Ste. Belge de l'Azote for design of facilities for production of acetylene and ethylene from liquid hydrocarbons.

TOA NENRYO KOGYO K.K. (55% owned by Standard-Vacuum Oil).
Plant site: Kawasaki.
- Construction: Planning to build a new petrochemical plant for operation in 1962 with Esso Research and Engineering's technical assistance. Naphtha to be used as raw material for the production of ethylene (62,000 tons per year), propylene (50,400 tons), butadiene 11,300 tons), n-butanol (3,400 tons), i-butanol (2,900 tons), octanol (10,000 tons), and polypropylene (10,000 tons).

KOREA

KOREAN GOVERNMENT.
Plant: Chung-Ju.
Product: 270 tons per day of urea.

MALAYA

STANDARD VACUUM OIL CO.
- Construction: Plans call for a new refinery and chemical fertilizer plant. The fertilizer plant has been proposed to the Malayan Government by Standard Vacuum and Wah Chang Corp. of New York. Preliminary plans are to produce ammonium sulfate and urea.

MEXICO

PETROLEOS MEXICANOS, Apdos 34 Bis.-36 Bis., Av. Juarez, Mexico 1, D. F.
Plant: Atzcapotzalco near Mexico City.
Products: Sulfur (35 tons per day) and dodecylbenzene (45 tons per day).
- Construction: Polyethylene plant (ICI process), with capacity of 22,000,000 lb. per year, is being engineered by Simon Carves, London.

Plant: Ciudad Madero near Tampico.
Product: 40 tons of sulfur per day.
- Construction: Arthur G. McKee & Co. has contract for facilities to produce dodecylbenzene (45 tons per day), butadiene (30,000 tons per year), styrene (15,000 tons per year), and copolymer (20,000 tons per year). Lummus Co. has contract for ethyl chloride (15,000 tons per year) and ethylene dichloride (22,000 tons per year).

Plant site: Chihuahua.
- Construction: Plans call for a 200-ton per day ammonia plant.

Plant site: Minatitlan.
- Construction: Fluor Corp. has contract for 200-ton per day anhydrous ammonia plant and an aromatics extraction plant to produce benzene, toluene, cumene, ethylbenzene, orthoxylene, and mixed para and meta-xylenes.

Plant site: Salamanca.
- Construction: Lummus Co. has contract for 200-ton per day anhydrous ammonia plant.

NETHERLANDS

AKU and BRITISH INDUSTRIAL PLASTICS.
- Construction: A jointly owned company reportedly was expected to be formed to build a plant for manufacture of urea and melamine formaldehyde and resins.

ALBATROS SULFURIC ACID & CHEMICAL WORKS.
Plant site: Vlaardingen.
- Construction: Chemical Construction, Ltd., has two contracts, one involving construction of a sulfuric acid gas plant with capacity of more than 100,000 metric tons per year, and the other

what's your best estimate?

. . . a quiz for Chemical Executives who want to keep posted

QUESTION 1. In 1959, 28 plants in the United States were producing ethylene—the hydrocarbon intermediate which is way ahead of all others both in quantity produced and in versatility. What was the estimated total U. S. capacity for this valuable chemical in 1959?

a — 3.7 Billion Pounds

b — 4.9 Billion Pounds

c — 5.6 Billion Pounds

d — 6.4 Billion Pounds

QUESTION 2. How many of the U. S. ethylene plants were designed, engineered and constructed by the Lummus Company?

	PLANTS	CAPACITY
a	3	.4 Billion lbs.
b	5	.6 Billion lbs.
c	7	.8 Billion lbs.
d	9	1.0 Billion lbs.

ANSWERS: 1. *The answer is (c)—5.6 billion pounds, according to* Chemical Week's *Report on Ethylene, May 9, 1959.*

2. *Again the answer is (c). In the last 10 years Lummus has 7 Ethylene plants to its credit in the U. S. alone with a combined capacity of .8 billion lbs. Lummus' world-wide total is 15, with a combined capacity of over a billion pounds per year. For ethylene projects, or any type of process plant, call on Lummus' 50 years of experience in design, engineering and construction.*

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plant will decompose sulfuric acid refinery sludge from an adjacent Shell refinery.

CALTEX PETROLEUM MAATSCHAPPIJ (NEDERLAND).
Plant: Pernis.
Raw material: Refinery gas.
Product: 8 long tons per day of sulfur.

CONTINENTAL-COLUMBIAN CARBON (NEDERLAND), N.V.
Plant: Rotterdam.
Product: 30,000,000 lb. per year of high-abrasive carbon black.

DU PONT DE NEMOURS & CO., E.I.
Plant site: Dordrecht.
• Construction: Plans call for a 15,000,000-lb. per year acrylic fiber plant.

GOODRICH CHEMICAL CO., B.F., and ALGEMENE.
Plant site: Arnheim.
• Construction: Butadiene plant.

KETJEN CARBON, LTD. (Royal Sulphuric Acid Works).
Plant site: Rotterdam.
• Construction: Facilities for production of 27,000 tons of carbon black per year. Completion in 1960.

KONINKLIJKE ZWAVELZUURFABRIEKEN.
Plant site: Amsterdam.
• Construction: Synthetic phenol plant is scheduled for completion by the end of 1960.

KUNSTZIJDE UNIT, N.V.
• Construction: Styrene plant.

NEDERLANDSCHE DOW MAATSCHAPPIJ, N.V. (wholly owned subsidiary of Dow Chemical International).
Plant site: Rotterdam.
• Construction: Scheduled for completion early in 1961 is a $2-million styrene-butadiene latex plant.

NETHERLANDS STAATS MIJNEN.
• Construction: Plans call for tripling polyethylene capacity.

NEVILLE CINDU CHEMIE, N.V. (owned by Neville Chemical Co., Pittsburgh, and Teeruni N.V. of Holland).
Plant: Uithoorn.
Raw material: Unsaturated petroleum fractions.
Products: Aromatic petroleum solvents, heat-reactive resins, and thermo-plastic resins.

N.V. MAATSCHAPPIJ TOT EXPLOITATIE VAN KOOKSOVENGASSEN.
Plant site: Ijmuiden.
• Construction: Gas reforming plant to treat natural gas for production of ammonia synthesis gas, as well as a conversion plant.

ROYAL DUTCH-SHELL GROUP.
Plant: Pernis (Rotterdam).
Raw material: From adjacent refinery.
Products: Sulfur, synthetic detergents, polyvinyl chloride, resins, solvents, insecticides, alkyl chloride, epichlorhydrin, and synthetic glycerine. Recently completed was a 60,000-ton per year plant to produce styrene and butadiene.
• Construction: Plans call for construction of facilities to produce polyisoprene and polybutadiene. This would be the first commercial availability of these products in Europe. Site is not known.

STAATSMIJNER in LIMBURG.
Plant site: Geleen.
• Construction: Scientific Design Co., Inc., has contract to build facilities to produce phthalic anhydride.

PAKISTAN

CONSTOCK INTERNATIONAL METHANE, INC., and **PAKISTAN PETROLEUM LTD.**
Plant site: Sui area.
• Construction: Plans call for construction of a 300,000-ton per year carbon-black plant. The new plant would cost about $5 million.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP.
Plant site: Multan, West Pakistan.
• Construction: Fertilizer plant to produce 103,000 tons per year of ammonium nitrate and 59,200 tons of urea scheduled to open late in 1960. Natural gas from Sui field will be used.
Plant site: Fenchuganj, East Pakistan.
• Construction: Fertilizer plant expected to open in 1961. Natural gas from Sylhet field will be raw material. Ammonia capacity will be 225 tons per day and urea capacity 375 tons per day.

PAKISTAN GOVERNMENT.
• Construction: Plans have been announced for new facilities to produce plastics, fibers, and petrochemicals based on natural gas.

PERU

FERTILIANTES SINTETICOS, S.A., Callao (seaport for Lima).
Raw material: Fuel oil.
Principal products: Anhydrous ammonia (20,000 metric tons), ammonium sulfate fertilizer (7,500 tons), ammonium nitrate—fertilizer and technical grades (35,000 tons), nitric acid—98% by weight (1,500 tons), and nitric acid—53% by weight (54,000 tons).

POLAND

POLISH GOVERNMENT.
Plant site: Plock (Oswiecim Chemical Works).
• Construction: New petrochemical complex will produce fuels, phenol, acetone, ethylene, propylene, and solvents. Raw material will be newly discovered natural-gas supplies and a new refinery at Plock. Synthetic rubber is expected to be produced at rate of 50,000 tons per year by 1965.
Plant: Tarnow.
Raw material: Natural gas.
Products: Methanol, chloroform, carbon tetrachloride, monochloromethane, acetone, caprolactam, formalin, and other products.

POLIMEX.
• Construction: Imperial Chemical Industries has made an agreement with Poland for ICI licenses and processes for polyester production. Polimex will make polyester fiber in a plant to be started in 1963.

PORTUGAL

AMONIACO PORTUGUES SARL.
Plant: Estarreja near Oporto.
Raw material: Heavy gasoline.
Product: 110,000 tons per year of ammonium sulfate.

MONTECATINI and **UNIAO FABRIL DO AZOTO.**
Plant site: Labradio.
• Construction: New urea plant will be built with capacity of 40,000 metric tons per year. M. W. Kellogg Co. has contract.

RESINAS SINTETICAS, LDA.
Plant: Near Lisbon.
Product: Maleic, alkyd, and phenolic resins (600 tons per year) and urea-formaldehyde (1,000 tons).

SHINETSU CHEMICAL and **MITSUI TRADING CO.** (in a joint venture with four Portuguese companies).
• Construction: Plans call for a polyvinyl chloride plant with initial capacity of 300 to 500 tons per month.

SODIEDADE PORTUGUESA DE PETROQUIMICA SARL.
Plant site: Lisbon.
• Construction: Ammonia plant (185 tons per day), and facilities to produce pure hydrogen, nitrogen, oxygen, and carbon dioxide.

UNIAO FABRIL DO AZOTO (subsidiary of Companhia Uniao Fabril).
Product: 70,000 tons per year of ammonium sulfate.

RUMANIA

RUMANIAN GOVERNMENT.
Plant: Fagaras.
Raw material: Natural gas.
Product: 30,000 tons per year of ammonium nitrate.
Plant site: Roznov.
• Construction: Ammonium nitrate plant capacity will be increased from 62,000 to 80,000 tons per year, with completion late 1962 or early 1963. Raw material will be natural gas.

SPAIN

CEPSA.
Plant: Las Palmas, Canary Islands.
Raw material: Refinery gas.
Product: Ammonia (90 tons per day) and ammonium sulfate (365 tons per day).

CEPSA and **JERSEY STANDARD.**
Plant site: Northern Spain.
• Construction: Proposal made to Spain for construction of a $26-million petrochemical plant.

CIA. ARAGONESA DE INDUSTRIAS QUIMICAS, S.A.
Plant: Sabinanigo, Huesca province.
Product: 1,500 tons per year of urea.

INI.
Plant site: Puertollana.
• Construction: Low-pressure polyethylene plant is planned.

MAVIPIAS INDUSTRIAL.
• Construction: Has proposed construction of a polyvinyl chloride plant.

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REPESA.
Plant site: Cartagena.
- Construction: Plans call for a urea plant with capacity of 200 to 220 tons per day, as well as facilities for production of ammonia, ammonium sulfate, and sulfuric acid.

ROYAL DUTCH-SHELL GROUP and UNION ESPANOLA EXPLOSIVOS.
- Construction: Shell is seeking approval of a $55 million project.

SWITZERLAND

REICHHOLD CHEMICALS CORP.
Plant: Hausen bei Brugg.
Product: 10,000 tons per year of phthalic anhydride.

TRINIDAD

FEDERATION CHEMICALS, LTD. (W. R. Grace & Co.).
Plant: Port-of-Spain.
Raw material: Hydrogen from locally produced gas.
Products: Ammonia (100 tons per day), urea (70 tons), sulfuric acid (200 tons), and ammonium sulfate (245 tons per day).

UNITED KINGDOM

BRITISH CELANESE CO., LTD.
Plant: Spondon, Derby, England.
Raw material: From thermal cracking process.
Products: Ethanol for acetic acid and isopropanol acetone.

BRITISH GEON CO. (owned by Distillers Co., Ltd., and B. F. Goodrich Chemical).
Plant site: Barry, South Wales.
- Construction: $5.6-million polyvinyl chloride plant is under way to increase capacity of present plant. Completion is expected late 1961.

BRITISH HYDROCARBON CHEMICALS, LTD. (owned 50% by British Petroleum, Ltd., and 50% by Distillers Co., Ltd.).
Plant: Grangemouth, Scotland.
Raw material: Naphtha.
Products: Ethylene, ethanol, diethyl ether, polyethylene, propylene, isopropanol, cumene, acetone, tetrapropylene, and butadiene. The cumene is used for manufacture of phenols (13,000 tons per year). New facilities for production of 70,000 tons of ethylene per year were completed in June 1960.
- Construction: Three plants to cost a total of about $14 million are being built near BP's 84,000-bbl. per day refinery to manufacture butadiene, methanol, and ethylene dichloride.

BRITISH PETROLEUM CO., LTD.
Plant: Grangemouth, Scotland.
Raw material: Refinery sour gas.
Product: 4,000 tons per year of sulfur.
Plant: Kent.
Raw material: Refinery sour gas.
Product: 6,000 tons per year of sulfur.

BRITISH SYNTHETIC RUBBER CO., LTD. (consortium of eight rubber companies).
Plant: Hythe, near Southampton.
Raw material: Butadiene and styrene.
Products: Synthetic rubbers of various grades. Capacity of 50,000 tons to be increased to 90,000 tons per year.
- Construction: Facilities for production of 2,500,000 gal. per year of latex.

BRITISH VISQUEEN, LTD. (subsidiary of Imperial Chemical Industries, Ltd.).
Plant: Stevenage, Herts, England.
Product: Polypropylene film.

CABOT CARBON, LTD.
Plant: Stanlow, Cheshire.
Raw material: Petroleum fractions.
Products: Carbon blacks (55,000 tons per year in seven grades).

CHEMSTRAND, LTD.
Plant: Coleraine, Northern Ireland.
Raw material: Acrylonitrile.
Product: Acrilyan acrylic fiber (10,000,000 lb. per year).

DISTILLERS CO., LTD.
Plant site: Hull.
- Construction: New $6-million acetic acid plant will be built here with completion expected early 1962.

ESSO PETROLEUM CO., LTD.
Plant: Fawley, Hants., England.
Raw material: Petroleum fractions.
Products: Ethylene (40,000 tons per year), which will go to nearby plants of Monsanto Chemical Co. and Union Carbide; butadiene (42,000 tons per year); and sulfur (30,000 tons per year delivered in molten stage).
- Construction: New steam-cracking ethylene recovery and butadiene extraction units will be added by end of 1961 at cost of $15.4 million.

FORTH CHEMICALS, LTD. (British Hydrocarbon Chemicals, Ltd., and Monsanto Chemical Co., Ltd.).
Plant: Grangemouth, Scotland.
Raw material: From British Hydrocarbon Chemicals.
Products: Styrene polymer, ethyl, and diethyl benzene, polyethyl benzenes, and toluene.
- Construction: Capacity of plant to be increased to 50,000 tons per year by 1961.

GEMEC, LTD. (Union Carbide, Ltd.).
Plant: Fawley, Hants, England.
Raw material: Ethylene purchased from Esso's Fawley refinery.
Products: Ethylene oxide and derivatives.
Plant: Grangemouth, Scotland.
Raw material: Ethylene from British Hydrogen Chemicals, Ltd.
Products: High-pressure polyethylenes (11,500 tons per year).

GRANGE CHEMICALS, LTD. (British Hydrocarbon Chemicals, Ltd., and Oronite, Ltd.).
Plant: Grangemouth, Scotland.
Raw material: Tetrapropylene.
Products: Dodecyl benzene for manufacture of high-grade synthetic detergents.

IMPERIAL CHEMICALS INDUSTRIES, LTD.
Plant: Billingham, England.
Raw material: Petroleum gases.
Products: Anhydrous ammonia (60,000 tons per year), alkylated phenols, carbonylation alcohols, isopropyl alcohol, and acetone.
Plant site: Dumfries, Scotland.
- Construction: Facilities for polyester film. Eventual capacity will be 2,000 tons per year or more.

Plant: Heysham, England.
- Construction: Methanol capacity to be increased from 30,000 to 75,000 tons per year. Completion scheduled 1962.

Plant site: Severnside Site, England.
- Construction: Long-term plans have been announced for a large complex on a site near Avonmouth. Operations will be largely based on products from petroleum gases. Tentative plans call for a pipeline from Esso's Fawley refinery. Work has started on development of the site and construction of plants for making 35,000 tons per year of ethylene oxide, ethylene glycol, and related chemicals. Initial investment will be about $14 million. Scheduled on stream late 1963 is a 100,000-ton per year ammonia plant.

Plant: Wilton, England.
Products: Ethylene (more than 110,000 tons per year), propylene (more than 80,000 tons per year), ethylene oxide, propylene oxide, propylene glycol, ethylene glycol, para-xylene for dimethyl terephthalate-based polyester fibers, methane, butylene, butadiene, and other unsaturated hydrocarbons.
- Construction: New projects include a 30,000,000-lb. per year expansion of the terephthalic acid plant (for polyester fibers and films) to be completed in 1960. A polypropylene plant will go into production late 1960.

MONSANTO CHEMICAL CO., LTD.
Plant: Fawley, Hants, England.
Raw material: Ethylene.
Products: Polyethylenes (17,000 tons per year).
Plant site: Newport, Monmouthshire, Wales.
- Construction: New plant is almost completed to produce 15,000,000 lb. per year of maleic anhydride. Another plant now under way will have capacity of 5,000 tons per year of styrene-butadiene resins and latices.

PETROLITE LTD. (Petrolite Corp.).
Plant: Near Liverpool.
Raw materials: Petroleum hydrocarbons and chemicals.
Products: Demulsifiers, corrosion inhibitors, water-flood additives, paraffin removers, scale preventives, fuel additives, desalting chemicals, metal deactivators, and asphalt additives.

PHILBLACK, LTD.
Plant: Westbury-on-Trym, Bristol, England.
Raw material: Petroleum fractions.
Products: Reinforcing furnace carbon blacks in five grades (15,000,000 lb. per year).

SCOTTISH OILS, LTD.
Plant: Pumpherston, Scotland.
Raw materials: Petroleum extracts.
Products: Detergents.

SHELL CHEMICAL CO., LTD.
Plant: Carrington Works, England.
Raw material: Naphtha.
Products: Ethylene, propylene, styrene monomer, ethylene oxide, polyethylene, propylene oxide, benzene, toluene, xylenes, styrene co-polymers, isopropanol, glycol ethers, ethylene glycols, ethanolamines, polyethylene glycols, propylene

HARSHAW

typical

HARSHAW CATALYSTS

and how they are used

• DEHYDROGENATION CATALYSTS

CHROME-ALUMINA—available in powder or tablet form containing various percentages of chromium oxide supported on high surface area alumina—can be supplied as promoted catalyst and is also available as screened granules.

IRON—tableted iron oxide.

• REFORMING CATALYSTS

MOLYBDENA-ALUMINA—supported molybdenum oxide on alumina—available as microspheres for fluid techniques, or as tablets for fixed bed application.

NICKEL-ALUMINA—a spherical catalyst available as hard spheres measuring ¼″ to 1″ diameter—used for some types of gas reforming.

• DESULFURIZATION CATALYSTS

COBALT MOLYBDATE—a supported cobalt oxide—molybdenum oxide catalyst supplied in tablet form.

ZINC OXIDE—a pelleted zinc catalyst used in the desulfurization of natural gas.

MOLYBDENUM SULFIDE—powdered and tableted molybdenum sulfide.

• CHLORINATION CATALYST

COPPER—supported copper catalyst prepared and shipped as tablets or granules.

• HYDROGENATION CATALYSTS

NICKEL-KIESELGUHR—supplied as unreduced, or reduced and stabilized, tablets, ⅛″ to ⅜″ diameter.

NICKEL-ALUMINA—available in tablet form containing nickel as nickel oxide on high surface area alumina, or in spherical form supported on low area, high-fired alumina.

RUFERT FLAKES—reduced nickel protected by hardened oil shipped as free-flowing flakes for hydrogenation of all glyceride and acid fats.

COPPER-CHROMIUM OXIDE—shipped as powder or tablets, stabilized or non-stabilized, with varying ratios of copper oxide to chromium oxide.

NICKEL-ALUMINUM—powdered 50:50 alloy used for preparation of active nickel catalyst for low temperature hydrogenation.

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ZINC CHROME—a tableted zinc oxide—chromium oxide catalyst used in the synthesis of methanol.

MERCURIC CHLORIDE—a granular catalyst consisting of mercuric chloride on active, granular carbon used in the synthesis of vinyl chloride monomer.

COBALT THORIA—available as powder or tablets, a thoria promoted cobalt catalyst employed in Fischer-Tropsch synthesis.

COBALT—a supported cobalt catalyst in pellet form used in the synthesis of hydrogen sulfide.

• DEHYDRATION CATALYST

ALUMINA—powdered and tableted aluminum oxide supplied as an active, intermediate surface area catalyst.

• CUSTOM CATALYST

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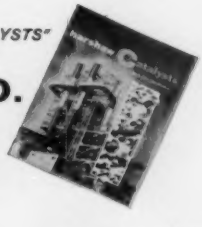

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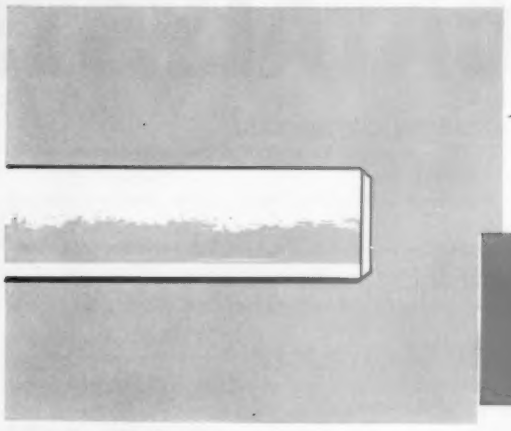
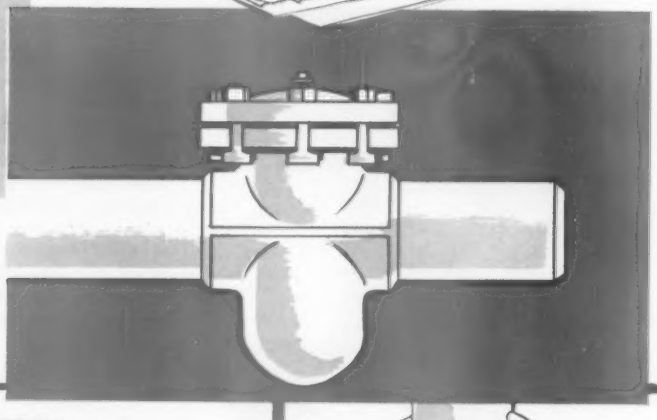


not this...

...but this!



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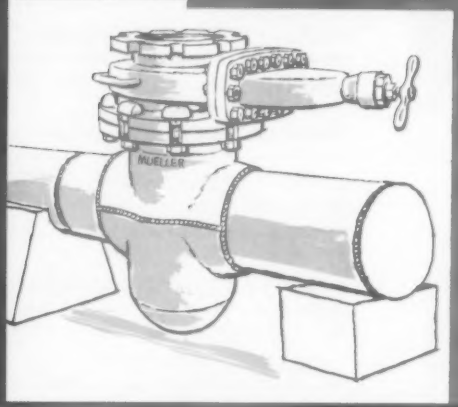
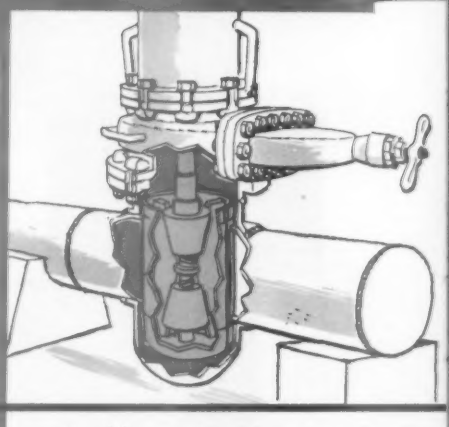
NO-BLO®

METHOD



Remove cap from fitting and install gate valve.



Attach line-stopping equipment, remove completion plug, and insert neoprene covered, expanding stopper. (No drilling required)

For complete information on these and other fittings, planned with an eye to the future, write . . .

an eye to the FUTURE

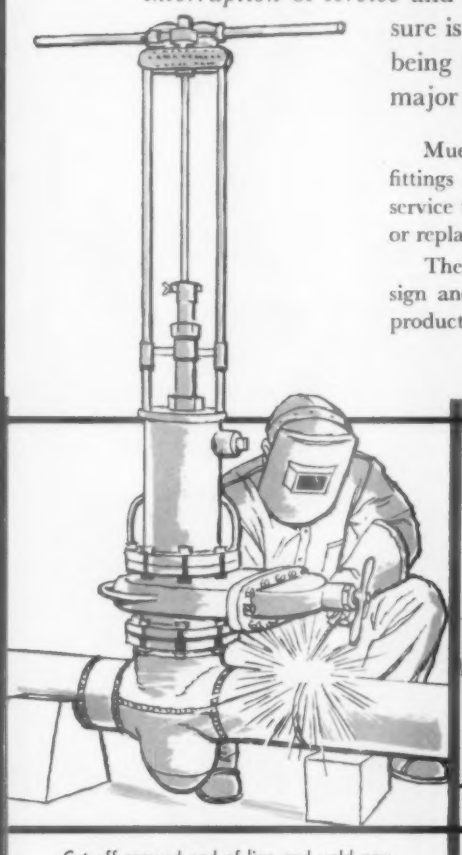
MUELLER®

Extension Stopper Fittings

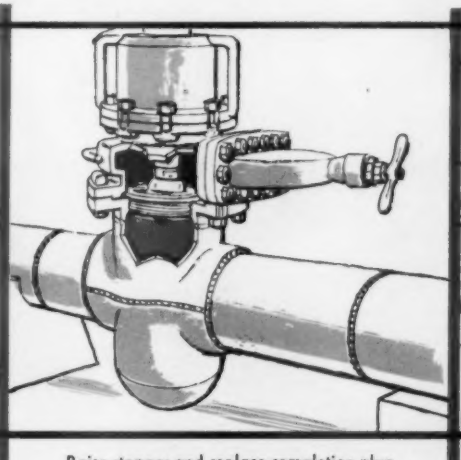
■ Refinery, oil field, *anywhere* that future system expansion is likely, cap all dead ends with Mueller Extension Stopper Fittings at the time the pipe is installed. When the line is to be extended, Mueller fittings save time and money with no *interruption* of *service* and *no need for expensive control valves.* Flow line pressure is safely stopped-off at the fitting while the extension is being welded into place. The following drawings illustrate major steps in using the Mueller Extension Stopper Fitting.

Mueller answers your future planning with swift, safe, economical fittings and equipment, not only to extend dead ends, but to transfer service to new lines, repair leaks, make tie-ins, run laterals, or to install or replace equipment, *without interrupting service.*

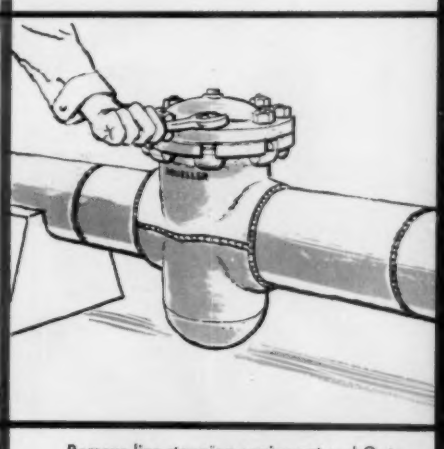
These fittings are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller No-Blo® product manufactured for the Petroleum industry.



Cut off capped end of line and weld new line to fitting.



Raise stopper and replace completion plug in top of fitting.



Remove line-stopping equipment and Gate Valve then bolt completion cap in place.

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5522

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Factories at: Decatur, Chattanooga, Los Angeles
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glycols, propanolamine, polypropylene glycols, ethylene oxide condensates, phenols, cresols, alcohols, isopropanolamines, ethylene glycol ethers, and octyl phenol condensates.
Raw material: Styrene monomer.
Products: Polystyrene molding powders to customer specifications.

- Construction: Production of ethylene oxide will be increased from 25,000 to 45,000 tons per year when new facilities now under construction are completed. Scheduled for completion in 1961 are facilities to produce 30,000 tons per year of polyethylenes and polypropylene. Set for completion in 2 or 3 years are facilities to produce polyisoprene and polybutadiene synthetic rubbers.

Plant: Shell Haven Chemical plant.
Raw material: Refinery gases.
Products: Dodecyl benzene for the manufacture of detergents (30,000 tons per year) and anhydrous ammonia (75,000 tons per year) for manufacture of nitrogenous fertilizers and elemental sulfur.

Plant: Stanlow chemical plant.
Raw material: Refinery gases.
Products: Olefins (some of which are sold to manufacturers for further processing and others used in Stanlow for product manufacture), resins, solvents (40,000 tons per year), naphthenic acids, naphthenic sulfonates, detergents, and elemental sulfur. Naphtha feed stock is also produced and piped to Carrington works.

WITCO CHEMICAL CO., LTD.
Plant site: Worcestershire, England.

- Construction: Plant to include facilities for production of tailor-made latices for the paint, rubber, paper, and textile industries. Construction was scheduled to start mid-1960 with completion early 1962. Initial output will be 4,000 tons per year.

UNION OF SOUTH AFRICA

AFRICAN EXPLOSIVES AND CHEMICAL INDUSTRIES (subsidiary of Imperial Chemical Industries).
Plant site: Johannesburg.

- Construction: Facilities for making methanol, formaldehyde, and ureaformaldehyde resins.

PHILLIPS CARBON BLACK CO. (owned jointly by Phillips Petroleum Co. and Industrial Development Corp. of South Africa, Ltd.).

- Construction: Carbon-black plant with capacity of 22,000,000 lb. per year. Plant is expected to go on stream in 1961.

URUGUAY

ADMINISTRACION NACIONAL DE COMBUSTIBLES ALCOHOL Y PORTIAND.
Plant: Montevideo.
Product: 6 tons of sulfur per day.

USSR

SOVIET GOVERNMENT.

- Construction: A $1.8-million plant for production of 9,000 long tons of polystyrene per year will be completed in 1960. The plant was ordered from P. G. Engineering, Ltd. Russia is also buying a 24,000-ton per year polyethylene plant from the West German firm of Berg- und Huttenbetriebe, and a 70,000-ton per year synthetic rubber finishing plant from John Dalglish & Sons, Ltd., a Scottish firm. In addition Werkspoor, a Dutch company, will reportedly construct three urea plants for the USSR.

VENEZUELA

INSTITUTO VENEZOLANO DE PETROQUIMICA.
Plant site: Moron.

- Construction: Facilities partly constructed for ammonia, ammonia products, and others. The institute is also studying a project for production of 20,000 to 40,000 tons per year of butadiene and styrene.

MONTANA FABRICA DE PINTURAS.

- Construction: Plans call for investment of $2.5 million in expansion of paint-manufacturing facilities to include polyvinyl chloride plastic materials and acrylic resins.

NEGROVEN
Plant: Moron.

- Construction: A $2.4-million carbon-black plant is scheduled for completion in 1960. Capacity will be 3,000 to 4,000 tons per year. Licensing agreement is with United Carbon Co., Inc.

YUGOSLAVIA.

FABRIKA AZOTNIH DUBRIVA.
Plant site: Pancevo near Belgrade.

- Construction: To remove hydrogen sulfide from synthesis feed gas for an ammonia plant to be completed in 1960.

RUDNAP.
Plant site: Lukavaz, Bosnia.

- Construction: Plans call for a $11-million nitrogen-fertilizer plant to turn out anhydrous ammonia (100 metric tons per day), nitric acid (340 tons), and calcium nitrate (380 tons per day). Completion scheduled 1962.

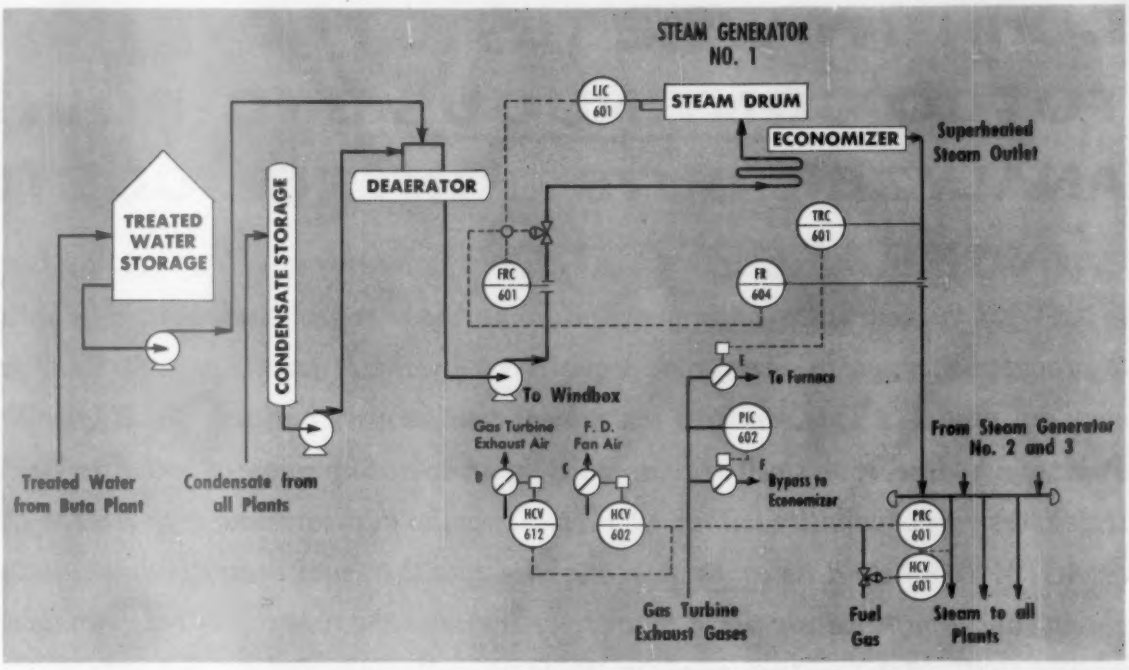
YUGOSLAV GOVERNMENT.
Plant site: Skopje, Macedonia.

- Construction: Acrylonitrile plant. Courtaulds, Ltd., has signed a $5.6-million contract to supply equipment.

Plant site: Zagreb, Croatia.

- Construction: Plans call for plastics plant.

THE EMERGENCE OF PETROCHEMICAL PLANTS outside the big established chemical centers of the world includes this 22,000,000-lb. per year oil carbon-black plant at Port Elizabeth, Union of South Africa. This one is being built by Phillips Carbon Black Co. Pty., Ltd., owned jointly by Phillips Petroleum Co. and Industrial Development Corp. of South Africa, Ltd. Completion is expected in 1961.



STEAM GENERATORS are conventional boilers with specially designed dampers and control systems to permit firing with gas-turbine exhaust gases and/or natural gas.

Waste-heat steam generators

provide good example of use of gas-turbine exhaust

for firing boilers

Automatic switchgear is provided for gas-turbine exhaust to forced-draft fan air. Boiler control system is fully automatic.

BY C. P. GOFORTH AND J. W. HALE

Petroleum Chemicals, Inc., Lake Charles, La.

THREE steam-generating units (pressure-fired type) are provided at the Petroleum Chemicals, Inc., ethylene plant. Each is rated for maximum continuous output of 215,000 lb. of steam per hour at 450 psig. and 650° F. TT (TT—total temperature equals saturated temperature plus superheat temperature). These are conventional boilers, but so designed as to permit firing with exhaust gas, from the three large gas turbines used as compressor drivers in the ethylene plant, supplemented by natural-gas firing. The over-all efficiency is thus raised, and there may be other important advantages (OGJ, June 29, 1959, p. 66). The steam generators are part of the ethylene plant, but they tie into the over-all plant steam system; most of the steam is used outside ethylene unit.

1. USING GAS-TURBINE EXHAUST

Four operating conditions were considered, as tabulated here:

Operation—	Steam capacity (lb./hour) Max. continuous cap.	Two-hour peak
1. Using natural gas only	215,000	236,000
2. Using gas-turbine exhaust only	30,000	.....
3. Using gas-turbine exhaust and supplementary firing natural gas	215,000	236,000
4. Steam generator off the line and gas turbine delivering exhaust gases (which are bypassed to stack)	.....	.....

Available gas turbine exhaust fuel flow provides heating value equivalent to nearly 135 M.M. B.t.u. per hour (LHV). Composition of the gas-turbine exhaust is such that it can be used as combustion air for the supplementary gas firing.

2. BOILER-CONTROL SYSTEM

An automatic switchover from gas turbine-exhaust to forced-draft fan is

COUNTRY-WIDE TESTS PROVE HOW TOTCO CONTINUOUS END-POINT ANALYZER CUTS CONTROL COSTS ...INCREASES YIELD

In major refineries from the East Coast to the West, the new Totco continuous End-Point Analyzer has demonstrated its ability to provide better control over product quality and yield. It quickly pays for itself and steps up profits. ■ This sensitive instrument continuously indicates the Engler End Point of a hydrocarbon stock or commodity in an operating range of 200° F. to 700° F. It delivers reproducibility within ±1°F., with results that correlate with ASTM D86 or ASTM D158. And its continuous analysis cuts the usual delays between quality change and compensating plant control... eliminates the time lag of batch analyzers or conventional laboratory tests. ■ Write or call today for further information. Request Bulletin 5900-11.

CASE HISTORY #1

Major Eastern Refinery

Use of the TOTCO End-Point Analyzer enabled this refiner to step up end-point specifications of reformer feed stock by 10°F with safety. Result: increased yield and a saving of over $200 a day. On the basis of this test, six additional Totco units were ordered!

CASE HISTORY #2

Major West Coast Refinery

Both TOTCO's End-Point Analyzer and Initial Boiling Point Analyzer were used here on a narrow-cut solvent. It was found that the analyzers kept yield on grade better than 99% of the time! Previous average with laboratory control was 90%.

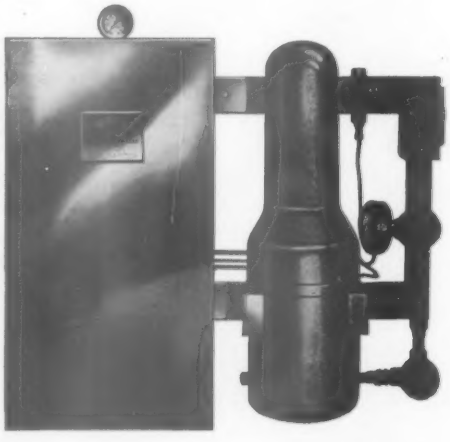
CASE HISTORY #3

Major Mid-West Refinery

In this test, the TOTCO End-Point Analyzer was mounted in a trailer and used on a crude still to control first-cut products on stream. So successful was the test that the company ordered two additional Analyzers for use at other refineries.

TOTCO CONTINUOUS INITIAL BOILING POINT ANALYZER

Totco also manufactures an Initial Boiling Point Analyzer. Write for Bulletin 1259-11 giving details and operating data.



TOTCO

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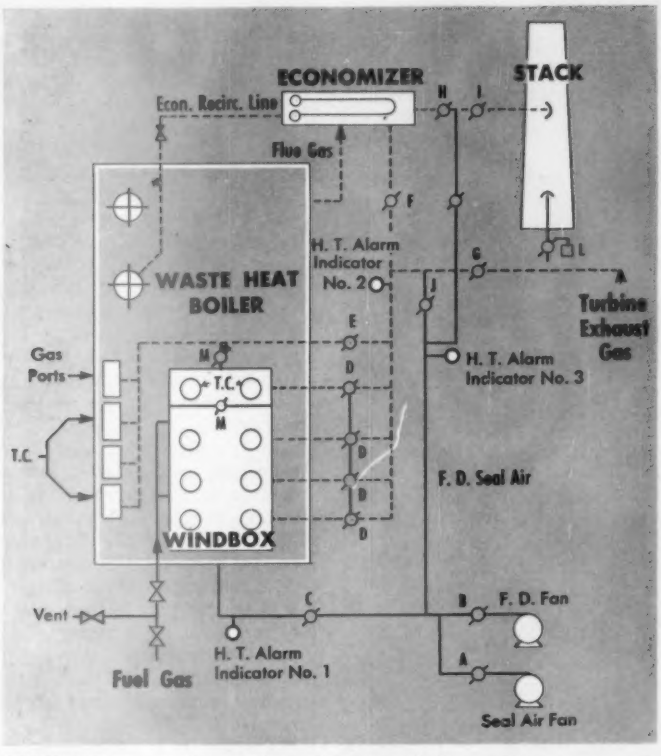
CASE HISTORY #4

Major Western Refinery

Demonstrating the versatility of the TOTCO End-Point Analyzer was this test where it was used to control the cut on heavy naptha. The test was a money-saving success, and the firm has since ordered additional units.



AUTOMATIC gas turbine exhaust-forced draft fan switchover prevents automatic boiler shutdown if the gas turbine shuts down.

included in the boiler-control system. The steam generators and feed-water system are largely conventional and so is the control system. However, all transmitters and controllers are electronic and we believe this is the first all - electric boiler - control system. A system of dampers was devised to cope with the direct operating situations. The automatic gas-turbine exhaust-forced-draft fan switchover prevents automatic boiler shutdown in case the gas turbine shuts down. If this happens, the forced-draft fan is automatically started and air is introduced into the windbox, while the turbine-exhaust dampers are closed off in time to prevent boiler shutdown.

A "gooser" amplifier is part of the three-element feed-water boiler control. This is a special bipolar amplifier which provides zero output at stable conditions; but when there is an upset, the amplifier provides increased output in the direction required to correct the upset. The amplifier then decays back to zero. Decay time is continuously adjustable over a range from 0.05 to 5 seconds.

Some of the major instruments and their functions are as follows: (Instruments for only one of the three steam generators are listed, since the other two boilers have identical controls.)

Instrument and Function

1. PRC-601—Board-mounted pressure recorder-controller controls superheater steam header pressure by varying fuel gas to each boiler through HCV-601A. Also varies forced-draft fan air flow (damper C) through HCV-602, or gas-turbine exhaust air to windbox (damper D) through HCV-612.

2. HCV - 601A, HCV - 602, HCV-612—Board-mounted indicating control stations. On **Auto,** each station output varies as PRC-601 output with provision for proportional band and zero adjustment. On **Manual,** each fuel - gas valve, forced - draft fan damper C, or windbox damper D, respectively, can be positioned manually from the loading station. The cams for the damper controllers were cut locally from firing data obtained by test runs at various steam loads.

HCV - 601A receives signal from PRC-601 and controls fuel-gas valves.

HCV-602 receives signal from PRC-601 (same signal as received by HCV-601A) and controls forced-draft fan outlet damper C.

HCV-612 receives signal from PRC-601 (same signal as received by HCV-601A) and controls turbine exhaust to windbox damper D.

3. TRC-601—Board-mounted temperature recorder - controller controls superheater outlet temperature by operating damper E between gas-turbine exhaust and furnace (not windbox). Arrangement is Manual-Auto.

4. PIC-602—Board - mounted pressure-indicating controller controls gas-turbine exhaust pressure by operating damper F in bypass line to economizer. Arrangement is Manual-Auto.

5. FRC-601—Board-mounted flow recorder - controller controls flow of boiler feed water to steam drum. Reset by LIC-601. Arrangement is Manual-Auto.

6. LIC-601—Board-mounted level-indicating controller alarm holds level in steam drum by resetting feed-water flow controller FRC-601. A board-mounted alarm is on each boiler for high or low steam-drum level, and a conventional alarm whistle is located on each steam-drum gage glass.

7. FR-604—Board - mounted flow recorder is on superheated steam make. Momentarily provides fadeout signal to FRC-601 **(boosts feed-water flow)** during changes in steam flow.

There are of course other instruments and alarms not listed here, including the usual shutdown and lock-pressure switches, solenoid block valves and bleeds on igniter lines, and scanners (flame detectors) on the pilot to each burner to indicate that the pilot flame is lit before the main burner gas is turned on.

Since these are pressurized boilers, each burner must be lighted by an igniter flame. An electric spark system is used to light these igniter flames. Before a main-burner gas cock is opened, the igniter flame must be verified. On the control board is a flame alarm telling the control operator that the igniter has flame. To be doubly positive an operator observes the flame through a glass window and by a central boiler telephone system relays this information to the operator on the firing deck and the operator in the control room.

3. AUTOMATIC SWITCHOVER

Gas-Turbine Exhaust to Forced-Draft Fan

A limit switch on the gas-turbine fuel-gas valve operates (through relays) four solenoids, that change positions of four dampers—B, C, D, and E. When the gas-turbine fuel-gas valve is closed, the solenoid on damper D control drive will energize and vent off one side of the air cylinder and put 50-psig. air on the other side thereby closing damper D. When the gas-turbine fuel-gas valve is not closed,

the solenoid will be deenergized, permitting normal operation of the damper control drive. Damper D then will automatically close (from the normally running, partially open condition) when the gas turbine fuel-gas valve closes.

The relay mentioned above is also used to operate a solenoid on HCV-602. When the gas-turbine fuel-gas valve is closed, the solenoid is energized, thereby opening damper C to the normal operating position dictated by HCV-602. When the turbine fuel gas valve is not closed, the solenoid is deenergized, blocking out the HCV-602 signal and putting 15-psig. supply air signal to the control drive thereby closing damper C. A local manual switch is provided to permit energizing the solenoid (for normal damper C operation) when the gas-turbine fuel-gas control valve is open. This is required for the reverse operation of switching from the forced-draft fan to gas-turbine exhaust.

With the gas - turbine gas - control valve closed, a solenoid is energized and damper E is closed. When the gas-turbine valve is not closed, the solenoid is deenergized and operation is normal via TRC-601.

Damper B is provided with necessary control drive and solenoid to close this damper when the gas turbine is running and automatically open it when the turbine gas valve closes. A local auto-manual switching arrangement is furnished, similar to that for damper C.

A handoff auto switch is provided for the forced-draft fans. By placing the switch in the auto position, automatic startup is provided (via relay on gas-turbine fuel-gas control-valve switch) of the fan when the gas turbine shuts down. This handoff-auto switch can be placed in the hand position to keep the forced-draft fan running continuously at any time.

A windbox air-pressure switch is tied into the boiler-shutdown circuit to shut the boiler down on low windbox pressure. The boilers, then, still have loss of combustion air shutdown protection in the event the automatic switch from the gas turbine exhaust to forced-draft fan air is not accomplished fast enough.

It is possible to switch from forced-draft fan to gas-turbine operation without shutting down the boilers by the proper manual operation of dampers C and D. With the gas turbine at normal speed (exhaust pressure is held at 10-in. water) damper D is manually opened and damper C is manually closed.

Damper M in main windbox is set to allow cooling air to pass through upper two burners so that burner-point temperature does not exceed 950° F.

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Serving processors who want high yields of high octane gasoline begins at Houdry, with three efficient and flexible catalytic processes.

The HOUDRIFLOW Process accepts in liquid or vapor form any fraction between naphtha and asphalt from both sweet and sour crudes. In the HOUDRESID Process, reduced crudes are converted into high octane gasoline and light distillate fuel—without production of heavy residual fuel.

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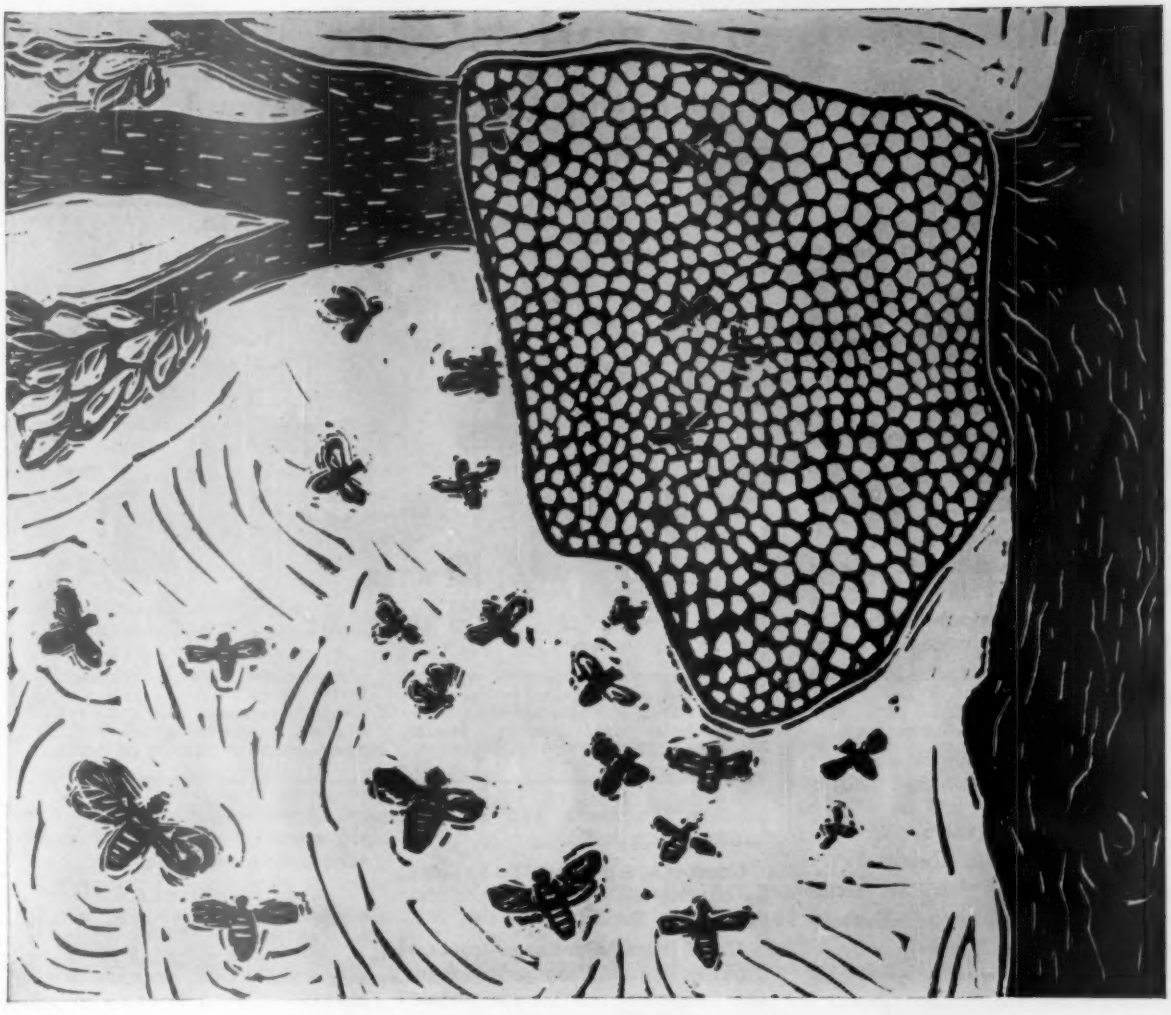

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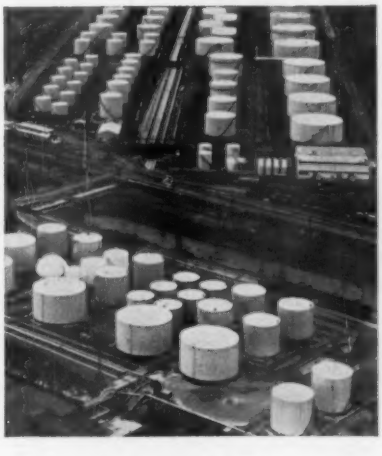

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Maintenance and Steam Traps

. . . there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

1. Be sure it's the right type of trap.

2. Be sure it's sized right and is for the correct operating pressure.

3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

1. Install them so they are accessible for inspection and maintenance.

2. Install a test valve.

3. Use a union or unions.

4. Use a shutoff valve or valves.

5. Use a strainer ahead of the trap if dirt conditions are bad.

6. Use a by-pass only where continuity of service is imperative.

7. Standardize inlet and outlet connections.

Preventive Maintenance Program

1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)

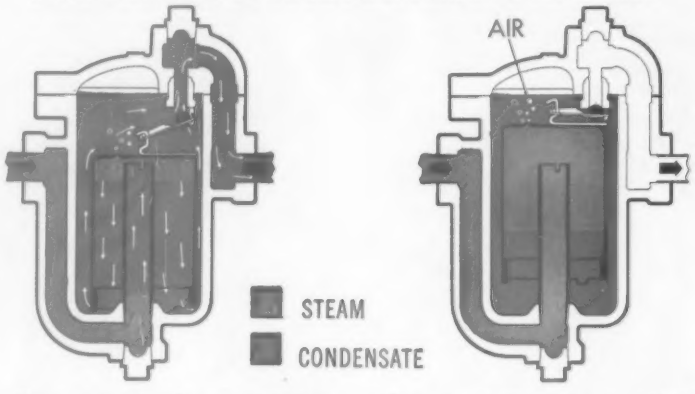
2. Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance . . . testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

HERE'S THE STEAM TRAP DESIGN
THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid — less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenance-reducing advantages:

1. Armstrong Traps are dependable.

2. Armstrong Traps require no adjustments — go from full load to zero load automatically.

3. Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.

4. Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.

5. Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

Armstrong Machine Works
8685 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

"See our catalog in Refinery Catalog"

Two thermocouples were peened on burner spud face of each of upper two burners to provide temperature indication and a permanent setting made for damper M. Additional thermocouples were located elsewhere for the same purpose.

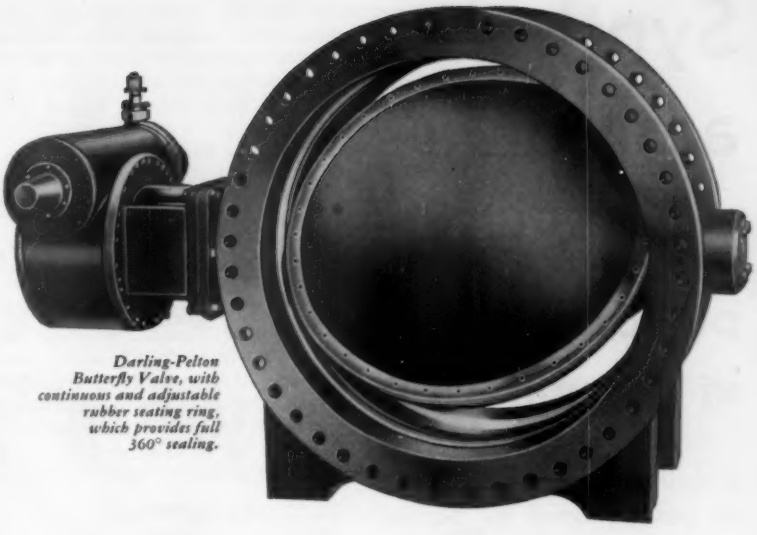
High-temperature alarms are installed in cooling ducts to protect ducts and equipment. The alarm for indicator No. 2 is in the gas-turbine exhaust housing. A small seal air fan is provided to keep a seal of cool fresh air between closed dampers B and C and protect the idle forced-draft fan from excessive temperatures when not in service.

Damper F, controlled by PIC-602, bypasses turbine exhaust gas to economizer. When pressure in ducts reaches 10.0-10.5 in. water, turbine exhaust gas is bypassed to economizer to reduce duct pressure and prevent shutdown of gas turbine. Each gas turbine has an overtemperature device which automatically cuts back fuel flow to turbine on high exhaust outlet temperature. Exhaust temperatures would be exceeded if exhaust pressure was above normal. If high exhaust pressure continues to climb, then counterweighted damper L will open and bypass the turbine exhaust to the stack to relieve duct pressure. When large amounts of turbine exhaust gas are bypassed to economizer, the economizer outlet-water temperature may get too high. The operator must watch the temperature indicator in economizer outlet and open L damper if necessary.

The dampers are so arranged that double dampers are provided between the turbine and the boiler, and between the boiler and the stack. To take a boiler out of service the turbine exhaust is cut directly into the stack and the boiler sealed off by the double dampers with fresh seal air maintained between them. By maintaining seal-air pressure greater than turbine exhaust pressure, work inside the boiler can be safely completed without shutting the turbine down.

Some difficulty was experienced at first with poor lubrication in the damper bearings. Due to high temperatures in the damper assemblies, ordinary lubricants failed and the dampers would hang. A synthetic lubricant is now used and this hanging tendency has been practically eliminated.

To facilitate lubrication each bushing on the ends of the damper shafts was drilled and tapped. A small copper tubing was attached to the bushing and extended to a convenient and cooler location. A grease fitting was added to the end of the tubing and on a regular schedule each bushing is greased.



Darling-Pelton Butterfly Valve, with continuous and adjustable rubber seating ring, which provides full 360° sealing.

Surer sealing...easier maintenance

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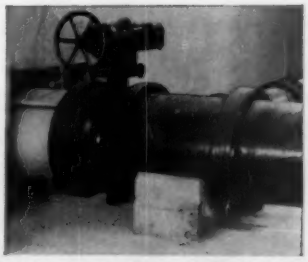
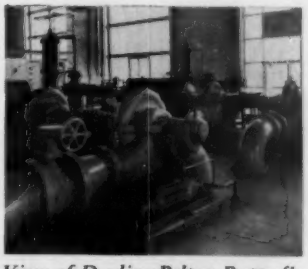
Darling-Pelton Rubber Seated Butterfly Valves are designed to give bubble-tight shut-off, easy operation and trouble-free service throughout the life of the valve. The sealing member is a continuous resilient ring displaced from the operating shaft... and fully adjustable to give bubble-tight closure around the circumference of the disc.

These high-performance valves are designed in accordance with A.W.W.A. specifications...for hydrostatic operating pressures up to 125 psi and velocities up to 16 feet per second. In addition to water service, they have been successfully used on vacuum, gas and chemical service.

To get *all* the facts, write us for Bulletin No. 5904.



Close-up view of installation in large municipal water plant.



View of Darling-Pelton Butterfly Valves installed in Pittsburgh's new filtration plant.

DARLING VALVES

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Synthetic ammonia–

Nation's No. 1 petrochemical in volume

is made largely from synthesis gas obtained by partial oxidation of oil or steam reforming of natural gas. Recently, ever-increasing amounts of ammonia have been going into production of urea.

Adapted from an article appearing in Foster Wheeler's "Heat Engineering," May-June 1960.

SYNTHETIC AMMONIA has the distinction of being the largest-volume petrochemical being produced in the United States with capacity now approaching more than 5 million tons per year.

As natural gas becomes more expensive and difficult to obtain, and fuel oils and residuum become more plentiful and readily available, the partial-oxidation route for manufacturing ammonia becomes more important.

The first partial-oxidation process, developed by Texaco Inc., was installed at Spencer Chemical Co., Vicksburg, Miss., in 1952. The full sequence for ammonia-urea manufacture based on partial oxidation was completed at the Deere & Co. and Grace Chemical Co. plants in 1954.

Feeds Processed

The accompanying table lists six different types of feed for which seven different process sequences are arranged to produce a specified quantity of anhydrous ammonia:

1. **Byproduct hydrogen from a chlorine-caustic electrolytic plant.** This nearly pure hydrogen contains a small percentage of oxygen which must be removed catalytically before ammonia synthesis since oxygen is a catalyst poison. The feed also is scrubbed with caustic soda to remove traces of other contaminants.

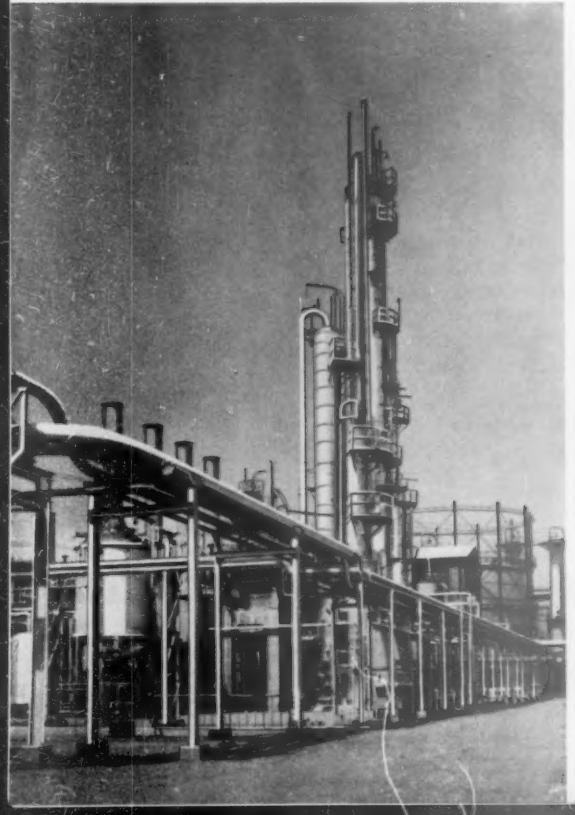
2. **Acetylene-plant tail gas** containing 60% hydrogen, 28% carbon monoxide, and smaller percentages of carbon dioxide, methane, acetylene and ethylene, is routed directly to shift conversion. Here in addition to the normal shift of carbon monoxide to carbon dioxide and hydrogen release, the acetylene is hydrogenated to ethylene and ethane. Carbon dioxide is removed by a suitable absorption medium and the hydrocarbons are condensed in the liquid nitrogen wash system.

3. **Refinery offgas.** In this plant, three streams from an adjacent refinery are treated to remove hydrogen sulfide and carbon dioxide. The remaining contaminants, ethylene, methane, and carbon monoxide, are removed by low-temperature fractionation and liquid nitrogen wash. The resulting hydrogen, as in all the cases using liquid nitrogen wash, is 99.9% pure.

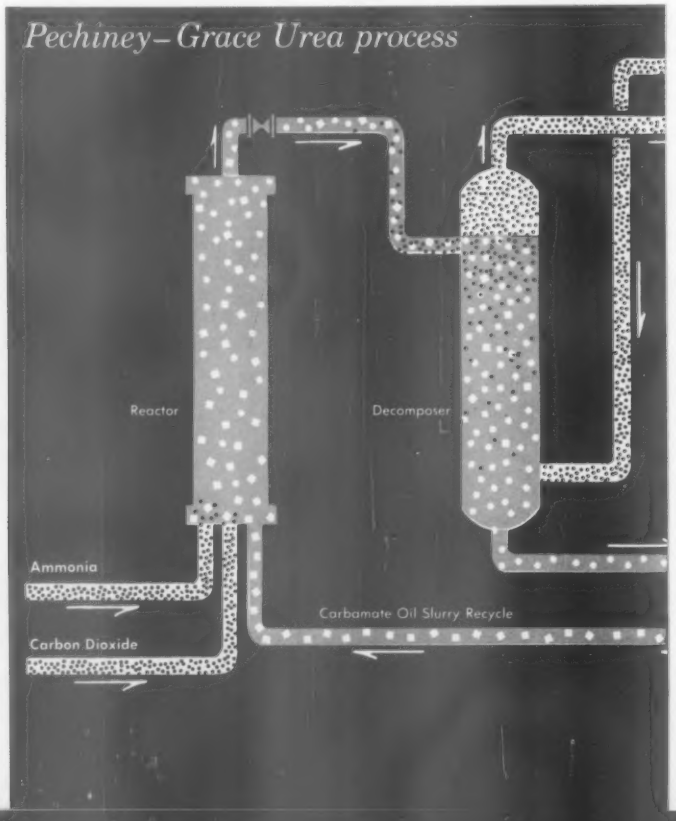
4. **Natural gas.** Texaco partial oxidation is the best known commercial process for the production of ammonia synthesis gas from both natural gas and liquid hydrocarbons. Reactors convert natural gas to hydrogen and carbon monoxide which then go through shift conversion, CO_2 removal, and liquid nitrogen wash.

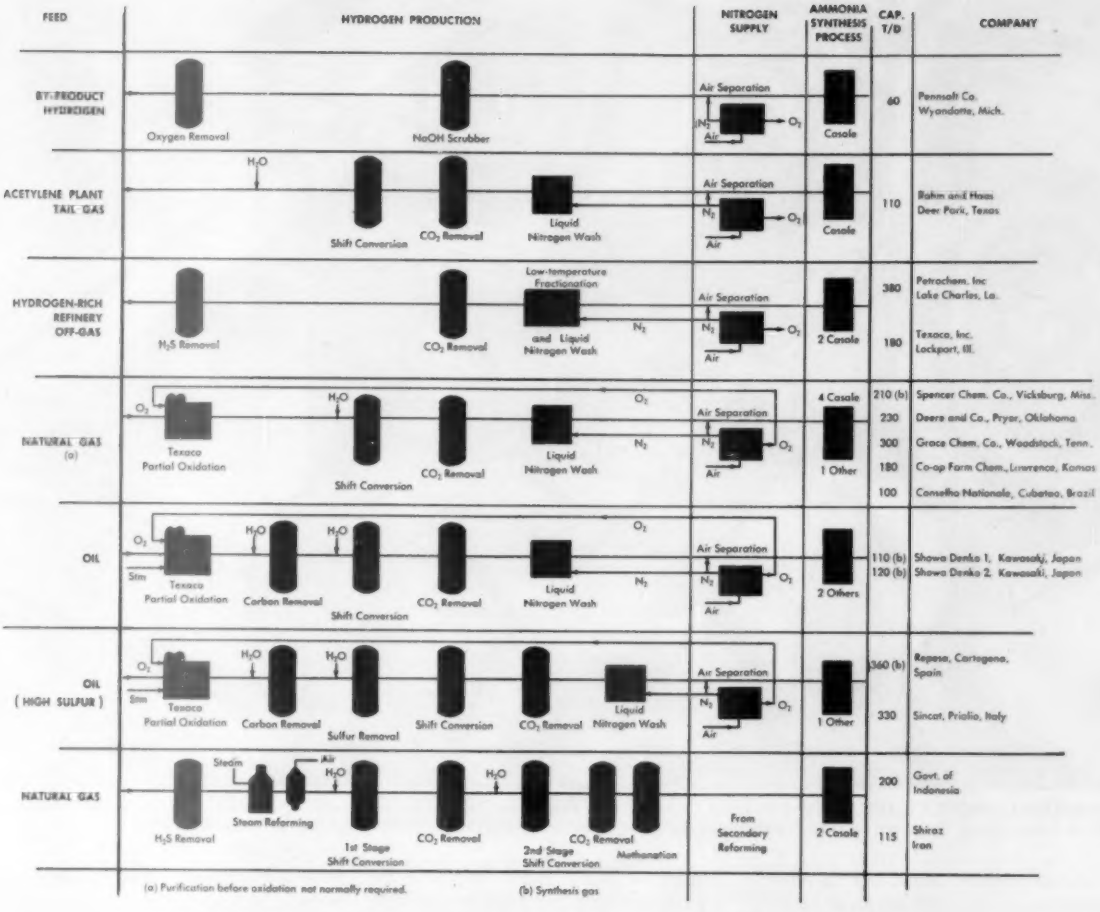
5. **Oil.** In processing oil via the partial-oxidation route it is necessary to provide a direct-fired oil preheater,

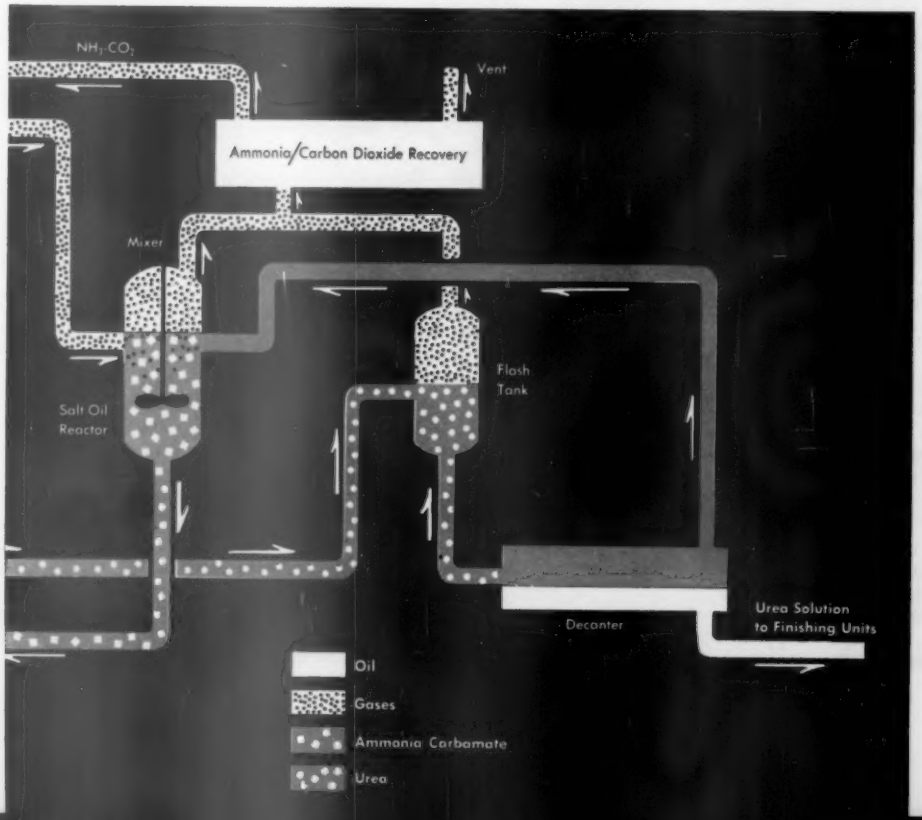
JAPANESE PLANT of Showa Denko, K.K. is producing 110 tons per day of ammonia synthesis gas from a combined feed of gas-oil and natural gas.



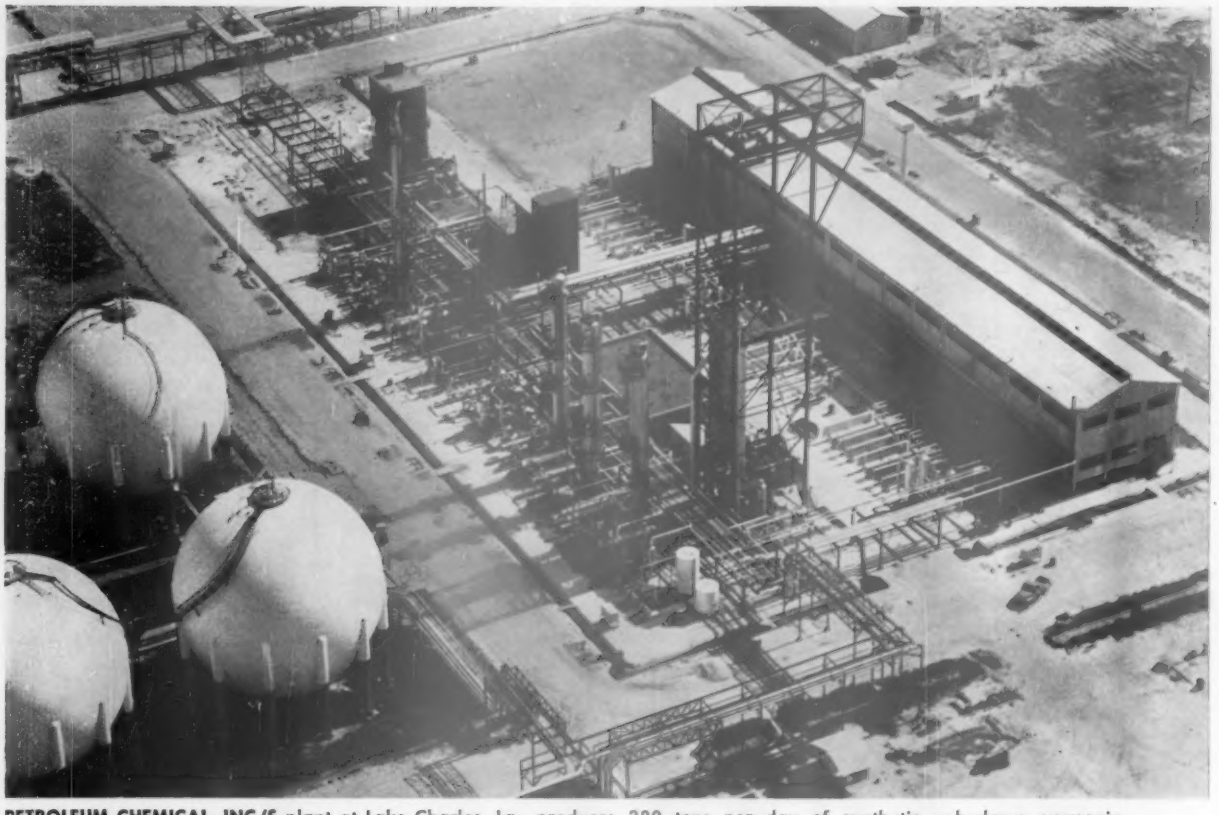
PECHINEY-GRACE PROCESS for urea production uses an oil carrier for recycling the unconverted reactants.







AMMONIA production can start from many different feed stocks and follow varied process sequences.



PETROLEUM CHEMICAL, INC.'S plant at Lake Charles, La., produces 380 tons per day of synthetic anhydrous ammonia. Three feed gases from an adjacent petroleum refinery supply hydrogen required for the synthesis reaction.

a steam superheater, and a water scrubbing section for removal of carbon particles carried over from the Texaco converter.

6. **Oil (high-sulfur).** These two installations were designed to process a heavy oil containing up to 8% sulfur. At such high-sulfur concentrations, desulfurization of the converter effluent is necessary to maintain the optimum activity of the shift catalyst.

7. **Natural gas through steam-methane reforming.** This process has been greatly improved in recent years and in locations where long-range supplies of cheap natural gas are assured, this is possibly the most economical process.

Urea

Two of the largest urea production plants in the United States are Deere & Co. and Grace Chemical Co. These two plants, designed and constructed by Foster Wheeler, have a urea-production capacity of approximately 180,000 tons per year. Both plants utilize the process now known as Pechiney-Grace. The outstanding feature of this process is the use of an oil carrier for recycling the unconverted ammonia and carbon dioxide. It is a complete recycling process.

The flow diagram shows the protection to metal parts provided by the circulating oil through the process. In addition to this corrosion-protecting feature, the function of this inert carrier is to absorb exothermic heat in the NH_3-CO_2 reaction and then provide endothermic heat required for conversion of the ammonium carbamate product of the reaction to urea. This provides a highly diffused energy transfer which is conducive to the production of a high yield of low biuret product. Evaluation of urea from other processes indicated that Pechiney-Grace urea is as low or lower in biuret content than most competitive grades. Although oil is used as a carrier in the process, the finished product contains only a few parts per million of oil. This is usually less than the oil content of urea made by other processes.

The ammonia and carbon dioxide, shown in the flow diagram as black dots, enter the reactor where they combine to form ammonium carbamate, (shown as white squares); the recycle stream, an oil-carbamate slurry, also enters the reactor. Reaction to carbamate is highly exothermic and the heat energy release supplies energy required for the second and final reaction: the dehydration of the ammonium carbamate to urea (shown as white circles) and water.

The effluent from the reactor, viz., urea, unreacted carbamate, water, and carrier oil flows through a pressure reducing valve from the 3,000 psi. reactor pressure to approximately 60 psi. into the decomposer where heat is applied to decompose carbamate into ammonia and carbon dioxide.

The aqueous urea solution and oil flows through atmospheric and subatmospheric flash systems to the decanter where the carrier oil settles as a top layer and is pumped to the oil surge and storage tank. The aqueous urea solution withdrawn from the bottom of the decanter is pumped to the urea finishing sections.

Unconverted ammonia and carbon dioxide gases, from the decomposer, flow to the salt-oil reactor where they combine to form solid ammonium carbamate finely dispersed in the circulating oil. This recycle stream of ammonium carbamate and oil is pumped back to the synthesis reactor.

Ammonia and carbon dioxide gases released in various parts of the unit, including that from the finishing operation, flow to an absorption-recovery section and are recycled to the decomposer. Test runs show no measurable loss of unreacted ammonia.

The importance of Simplicity in a retrievable squeeze packer

Complexity is a retrievable squeeze packer's worst enemy. Simplicity of design is the best guarantee that the packer will do its job well and retrieve.

Simplicity and reliability go together in the Baker Full-Bore Cementer. This rugged tool is trimmed to fighting weight. It sets and packs off easily. It holds pressures from above or below, and does it with a tenacious grip. It retrieves easily.

Here's a tool so good it has changed everybody's ideas on how a squeeze packer should perform. Thousands of successful high pressure cementing, frac, and testing operations demonstrate its success.

THE BAKER SERVICEMEN who run the Full-Bore Cementer have two important things working with them and for you. They have professional skill in running Baker service tools, and in the Full-Bore they have a superior tool to run. The combination offers a dependability that's hard to equal.

BAKER FULL-BORE CEMENTER

Product 410-C

BAKER OIL TOOLS, INC. HOUSTON / LOS ANGELES / NEW YORK

Facts about a reliable squeeze tool

1 It is an important squeeze cementing tool. (Full Bore makes reversing out sand bridges easy; and allows re-perforation, when necessary, without a round trip with tubing.)

2 Ability to hold pressure from above or below makes it ideal for testing casing.

3 Optional Baker Model *N* Full-Bore Tubing Tester permits testing of tubing string in conjunction with operation of the Cementer.

4 The Cementer is an important tool for formation fracturing and high pressure acidizing. (Full Bore helps prevent sand screen-out when fracturing. On completion of frac or acidizing operation, tubing may be swabbed immediately, without having to reset the Cementer. When pressure reverses, opposite set of slips takes over automatically. Packing elements stay packed off, resist pressure from either direction.)

5 It is teamed with the Baker Retrievable Bridge Plug in straddle operations—either single-zone or selective multiple-zone. Together they can straddle a virtually unlimited interval. And: because both Cementer and Plug are so easy to pick up and relocate, any number of zones can be tested and treated in one round trip.

6 An unloader allows circulation above the Cementer, or equalization of tubing-annulus pressures, when desired.

7 The packer retrieves simply and easily. For added protection, two emergency release mechanisms are built-in.

Did you ever see a catalyst working?

FIELD EMISSION MICROSCOPE being used to study activity of metallic catalysts. Image of surface under study appears on fluorescent bulb in right foreground.

THE FIELD EMISSION microscope, or the Müller projector, is being used by the Amsterdam Research Laboratories of the Royal Dutch-Shell Group to make fundamental studies of how catalysts promote chemical or physical reactions without undergoing change in themselves.

The emission microscope operates on the principle that most substances emit electrons when a high voltage is applied to their surfaces. Since an essential feature of catalysts is that molecules are absorbed on their surfaces, this instrument is well suited to observe the mechanism of this absorption and the nature of the reaction which takes place.

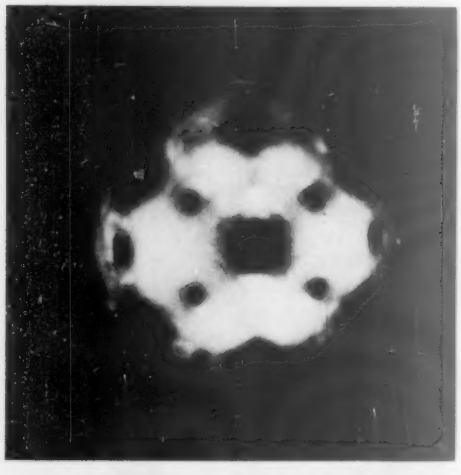
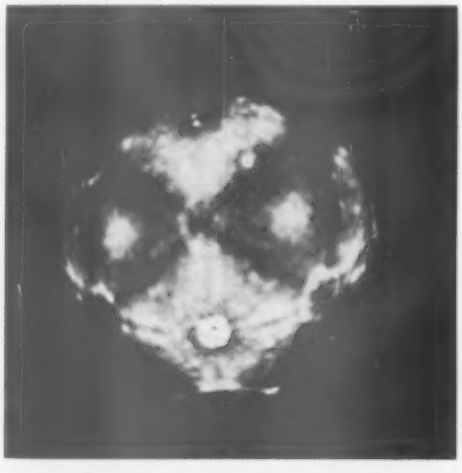
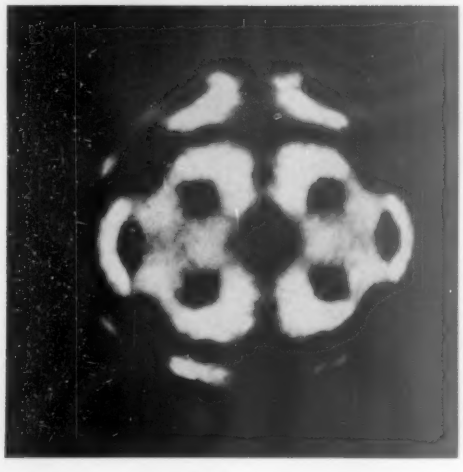


IMAGE of a clean tungsten crystal.

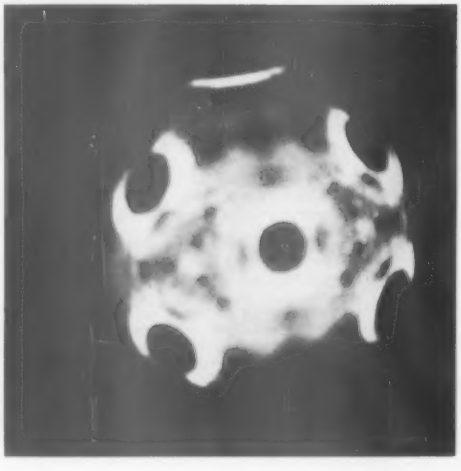


REORIENTATION progresses further at a temperature of 450° C.



TUNGSTEN CRYSTAL covered with positive ions. Bright spots represent groups of 4 to 6 ions which locally cause the electron emission to increase strongly.

IONS become reoriented when crystal is heated to 200° C. They have moved towards those places where the gain in energy is largest.



In Texas' Fullerton field

Mass attack launched against corrosion at well casings

IN THE Fullerton field of West Texas, the biggest anticorrosion program of its kind is now getting under way.

Electric power lines and rectifiers are being set to protect all 529 active wells in the field's "north dome" against external corrosion of their casing. Later, the 92 wells in the "south dome" will be added to the system. This great number of wells makes the Andrews County project by far the largest well-casing cathodic-protection system ever attempted. The problems posed by the project's size make it one of the most interesting.

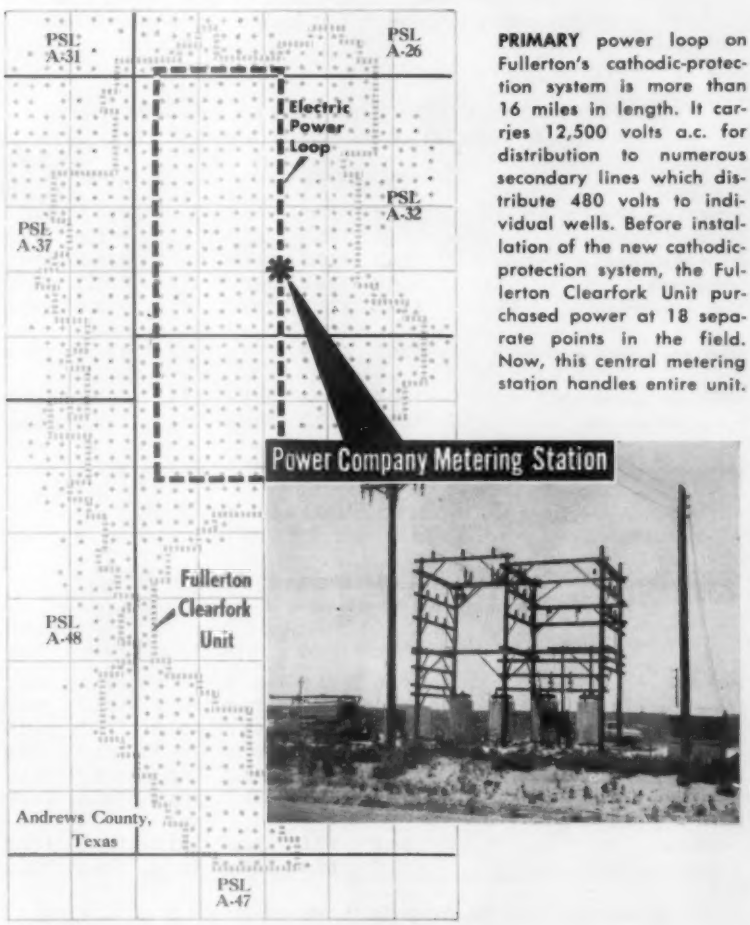
Monterey Oil Co. is operated of the mammoth Fullerton Clearfork unit.

BY ED McGHEE
Drilling Editor

Monterey along with its design contractor, Cathodic Protection Service, Houston, is now supervising installation of some 125 miles of power lines to serve the wells. More than 2,000 power poles are being set.

Electric current is being purchased in the field from a commercial power company. From the power-company's metering point, the current goes out in a 16-mile loop at 12,500 volts. Off this main loop, more than 100 miles of lines in secondary circuits distribute the current to the individual wells at 480 volts.

Each of more than 500 wells has its own rectifier and graphite ground bed. Each will take about 8 amp. of current.



PRIMARY power loop on Fullerton's cathodic-protection system is more than 16 miles in length. It carries 12,500 volts a.c. for distribution to numerous secondary lines which distribute 480 volts to individual wells. Before installation of the new cathodic-protection system, the Fullerton Clearfork Unit purchased power at 18 separate points in the field. Now, this central metering station handles entire unit.

San Andres is trouble source. The Fullerton-Clearfork field is big by any yardstick; it has already produced more than 100,000,000 bbl. of oil. Discovery was in 1941 but the unit was not formed until 1954. Between 1951 and 1957, nine casing leaks were detected.

Monterey's engineers weren't long in spotting the source of the trouble. It was the San Andres formation which lies between 4,000 and 5,000 ft. in the field. This dolomite zone contains sour water and is highly corrosive. Unfortunately, casing in the Clearfork producing wells had not been cemented high enough to cover the San Andres formation; cement in few of the wells rises above 5,100 ft. As a result, the long string of casing in the producing wells is exposed to San Andres fluid.

Monterey's engineers surmised that the casing leaks were due to external corrosion from San Andres fluid. In an effort to make sure of this diagnosis, Cathodic Protection ran casing-potential surveys in three unit wells. Unfortunately, the surveys were inconclusive; they showed no gross anodic areas on the pipe in front of the San Andres.

Monterey felt it necessary to have tangible evidence before going into an expensive big-scale corrosion-protection system. So, when another well developed a casing leak in 1958, the casing was pulled. The moth-eaten appearance of the entire 800 ft. of pipe through the San Andres left no doubt that this formation was to blame and that serious corrosion could be expected from all other wells in the field.

Some 17 Fullerton-Clearfork wells have developed casing leaks; most are definitely attributed to the San Andres zone. And, a second casing string has been pulled; it too was badly corroded in the area of the San Andres.

With this evidence at hand, Monterey and the other unit members felt

EACH OF THE 529 WELLS in the Fullerton Clearfork Unit's north dome has its own rectifier. The rectifiers are a new type in which the operating parts can be removed as a unit with new units plugged in their place.

they could delay no longer; the wells had to be protected before casing began to fail wholesale. Secondary recovery (both gas and water injection) promises to keep the unit producing for another 30 years. The expense of a big cathodic-protection system should be small compared to the saving in casing leaks for the next 30 years.

So, the Fullerton unit awarded a turnkey contract to Cathodic Protection Service to design and supervise installation of the protection system.

Centralize power. The only system that has ever shown itself successful for protecting well casing against external corrosion for long periods is the cathodic method. In this, current is impressed onto the casing so that the potential of the metal is higher than that of the earth. Thus, current flows onto the pipe from the earth, not vice versa. In the opposite case, where current leaves the pipe, it carries metal particles with it and causes what we know as corrosion.

From the casing-potential surveys they had already run, Cathodic Protection calculated that an average of 8 amp. per well would be sufficient to keep pipe potential above earth potential down to about 6,100 ft. This is deep enough to prevent corrosion far down into the cemented area.

As design for the cathodic-protection system developed, it was found that it could simplify its existing power system even as the new power was installed. The unit has been buying power from 18 separate meter points in the field; with the new system, there will be only a single meter point. Power for lights, electric-motor-driven pumps, and other uses will all be taken from the common system.

Among the innovations in equipment in the well-protection system is a new "plug-in" rectifier. Operating parts of the new rectifier can be removed as a unit and a new plug-in unit installed. Thus, servicing and repair of the rectifiers is greatly simplified compared to conventional units.

Nelson Refinery Cost Indexes

Published in the first issue each month in the Technology-Operations Section.

Compiled by W. L. Nelson, technical editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

Refinery Construction Cost Index (1946 Basis)

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1957	1958	1959	April 1960
Pumps, compressors, etc.	138.2	166.5	206.7	214.7	226.5	228.1
Electrical machinery	134.9	160.0	188.9	192.7	195.8	197.5
Internal-combustion engines	126.0	150.5	173.9	178.3	178.5	179.0
Instruments	127.8	154.6	187.4	194.9	201.0	198.6
Heat exchangers	140.0	171.7	203.6	181.2	178.9	195.7
Misc. equipment average	*126.2	160.7	192.1	192.4	196.1	199.8
Materials component	149.5	174.6	201.9	204.2	207.8	207.9
Labor component	144.0	183.3	208.6	220.4	231.6	239.0
Nelson construction index	146.2	179.8	205.9	213.9	222.1	226.2

*Used in computing the Nelson Index until April 1952.

Refinery Operating Cost Indexes (1956 Basis)

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1958	1959	March 1960
Fuel cost	49.6	81.0	86.5	102.1	103.5	106.0
Labor cost	73.1	88.7	90.9	105.0	102.3	101.6
Wages	52.4	81.5	88.7	105.4	111.5	110.9
Productivity	68.3	90.2	97.1	100.3	109.0	109.2
Investment, maintenance, etc.	51.2	83.6	92.0	109.5	113.7	115.2
Chemicals cost	37.0	72.1	85.7	104.4	107.8	114.0
Operating cost indexes:						
Refinery	58.5	80.5	88.7	105.8	106.8	108.3
Process units†	62.9	82.2	88.4	105.8	106.0	106.7

†Add separate index for chemicals, if any are used.

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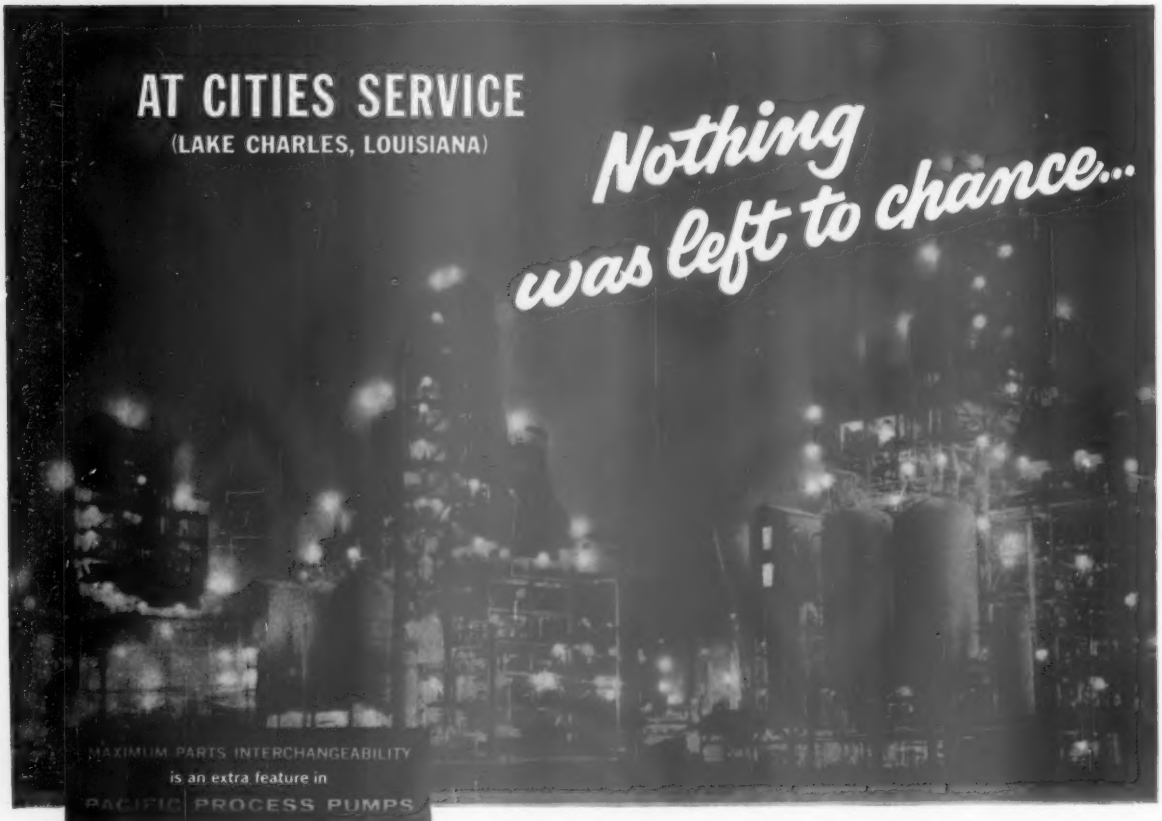
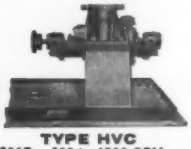
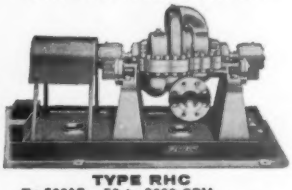


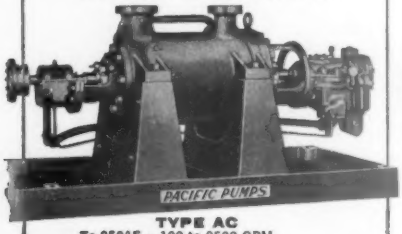
TYPE SVC
To 850°F.—25 to 3200 GPM
To 600 PSIG—To 650 DIFF. HD. FT.



TYPE HVC
To 850°F.—600 to 4500 GPM
To 600 PSIG—To 1000 DIFF. HD. FT.



TYPE RHC
To 500°F.—50 to 3000 GPM
To 700 PSIG—To 1300 DIFF. HD. FT.



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Properties of sucker rods (continued)

BY JOSEPH ZABA

CORROSION-FATIGUE tests under simulated oil-well conditions[1] were first studied by Dr. Blaine B. Westcott in the early thirties. These tests were made with a modified R. R. Moore rotating-beam-type fatigue-testing machine. The modification consisted of enclosing the test specimen in a thin rubber tube attached through stuffing boxes to the bearings of the machine.

A system of water reservoirs was arranged which permitted circulation of oil-field brines, or synthetic brines, through the tube and keeping the test specimen immersed during the test. A pressure was maintained throughout the apparatus with natural gas to exclude air. The corrosion-fatigue limit was assumed as the stress which did not cause failure in 10,000,000 reversals at the frequency of 1,750 applications per minute at 125° F.

From the tests originally conducted certain fatigue limits were arrived at for 1.25% manganese steel, working under different sets of corrosive conditions. These tests were followed by others from which there evolved sets of data for endurance limits for different types of sucker-rod materials for conditions of oil-field brine and hydrogen sulfide corrosion.[2] API Code 30 was prepared, standardizing the conditions of the test.

Many attempts have been made to correlate the results of laboratory tests with field performance of the steels tested. In 1940 D. R. Dale and D. O. Johnson reported on field tests, conducted for this purpose in Kansas, Oklahoma, and West Texas.[3] Certain simplifications were made in order to arrive at comparative field data. The number of reversals to failure was obtained by multiplying the average number of strokes per day by number of days to failure. This did not account for possible well shutdowns, for which there was no record.

The stress at the point of failure was found by measuring the polished-rod load and calculating the load at the pump. This furnished the load gradient from which stresses could be calculated for any desired point of the rod string. Only a fair degree of correlation was obtained in these and other similar tests. In addition, some of the investigators reported laboratory-test results which were not consistent with normally expected field behavior of the steels tested.[4]

Lack of correlation between laboratory and field results is understandable for these reasons:

1. The test specimens are subjected in the testing machines to a complete reversal of stresses from maximum compression to a maximum tension. The sucker rods in an oil well are normally subjected to a range of longitudinal stresses from zero stress to maximum tension; also to bending, wear, and impact.

2. To make possible the comparison of different tests, the testing-machine specimens have highly polished surfaces to eliminate the effect of any stress raisers. In actual sucker-rod operation stress raisers are present and affect the endurance limit.

3. The time element, already discussed, and its effect on the corrosion fatigue endurance limit, enters into consideration. For instance, 1 day of operation of a test specimen in a corrosive medium at 1,750 applications per minute corresponds to about 87 days of operation of sucker rods in a corrosive medium for an installation with pumping speed of 20 s.p.m.

4. The chemical composition of the fluid produced by the well may change during the well's life.

The investigators who developed or conducted the corrosion-fatigue endurance-limit tests were aware of the limitations of these tests. The fact was well publicized that the results of these tests are relative only and give only comparative values for different steels. Nevertheless, the results were taken by many as being literally correct. This brought about, in many cases, misapplication of the published data. Because of this, API Code 30 was withdrawn at the recommendation of the API Task Group on Corrosion Fatigue.

The question of selection of rods reverted to that of following the recommendations of individual manufacturers or opinions of the users, based on their experience. With development of the highly efficient organic-type corrosion inhibitors some users disregard corrosion in the inhibited wells. Others feel that inhibition is never 100% effective and they use correction factors when selecting allowable stresses for rods.

Mixed string tests. In the last several years there has been a revival of interest in the question of fatigue and corrosion fatigue of oil-industry steels. The work is being coordinated by the appropriate groups in API and the National Association of Corrosion Engineers. As far as sucker rods are concerned this revival of interest finds expression in the so-called mixed-string field tests being conducted.

In such tests, which extend usually over a long period of time, rods, marked for identification, are placed alternately in the strings by makes or by steels. Parted rod is replaced in the some place in the string with the same make and grade of the rod. Nature of each failure is carefully studied. Wells are handled normally and are periodically weighed with a dynamometer.

Results of one group of such tests were reported recently by O. C. Atkinson.[5] Involved were 22 tests conducted in Kansas in Arbuckle lime wells, which are corrosive and produce very high cut of water. The wells were inhibited. The tests were conducted over a period of 2 years or until failures in any string became excessive.

Primary purpose of the tests was to compare the 1036 and 4600 series steel rods. The tests showed a smaller number of breaks per 100 rods for 1036 steel rods than for 4600 steel rods. While the tests were not intended to compare the manufacturers, there were differences in performance of rods made from the same steel furnished by different manufacturers. This suggests that differences in rod-manufacturing processes affect the quality of rods.

Results of one group of tests conducted under one set of conditions cannot be generalized. However, for similar well-producing characteristics, tests of this type may be of considerable economic value.

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Savings possible from careful preplanning

Old record of 27 days and 19 bits to 9,000 ft. went by the boards as contractor reached 9,100 ft. in 20 days using only 11 bits. Credit is given entirely to advance planning.

BY ED McGHEE
Drilling Editor

IF THERE'S any question that thorough advance planning of drilling operations can save money, the doubt should be dispelled by two newly completed wells in Bakke field of Andrews County, Texas.

This is an area famed for hard-rock drilling. In spite of the hard rocks, Ard Drilling Co., Abilene, Tex., has made important cuts in drilling time and number of bits used in both its last two wells in Bakke field. Both holes were on contract from Pure Oil Co. on that firm's Parker "K" lease. First of the wells, the K-2 Parker, reached total depth of 9,100 ft. only 23 days and 15 bits after spudding. The other well, the K-3 Parker, did even better, racing to 9,100 ft. in only 20 days and using only 11 bits. Rotating hours were roughly the same for both.

Best previous record in the field was 27 days and 19 bits to 9,000 ft. It has not been uncommon for some routine wells to stretch out to 30 days and 22 or 23 bits.

The difference with the K-2 and K-3 Parker was made well in advance of each spud date. Then, at a comfortable time before operations began, Ard elected to follow a carefully planned program tailored to the conditions in each specific location. The programs set out weight on bit, rotary speed, bit types, and hydraulics. While most contractors use some form of advance schedule, few such programs have the advantage of as much concentrated effort as these two.

Ard Drilling already had a number of Bakke field wells behind it; company personnel were familiar with most bottom-hole conditions. To supplement this knowledge, the bit supplier was called in for records of all other holes drilled in the area. In addition, the supplier, Hughes Tool Co., was armed with the latest findings from its own and other companies' research laboratories.

From the joint efforts of both firms, a new drilling program was set up for the K-2 Parker location. Ard hoped that this new program afforded best chances for faster drilling with fewer bits.

RED WEISS, Ard Drilling Co.'s day driller, mans the record-breaking rig. Drillers started weight off light, gradually raising it as the bit dulled so that penetration rate was kept sufficiently high. Low rotary speeds kept bit teeth sharp longer.

Once the K-2 was spudded, drilling practices were held fairly close to those set out in the previously "engineered" program. Then, after actual drilling stopped and while the K-2 was being completed, the program was adjusted even finer for the upcoming offset well, the K-3.

Some departures. It wasn't easy to make such healthy cuts in drilling times; the area has been heavily drilled for several years. Moreover, bit weights in the area around Andrews County have traditionally been higher than anywhere else in the oil world. Here are the changes made in the tailored bit program which resulted in the new records:

1. On most runs, bit weight began low and was generally raised throughout the run. This was done to preserve initial sharpness of the bit; as bit teeth dulled, more weight was added to keep penetration rate sufficiently high.

2. Rotary speeds were calculated at near optimum for bit weights used on each particular run. Even in nonabrasive shales and limes, these speeds are lower than most often used; intent was to preserve both the sharpness of the bit teeth and the life of the bit bearings so that bit run and drilling speed would be near optimum.

3. Through abrasive sand sections, rotary speeds were held even lower to preserve the bit teeth.

4. New compact-type bits were used which have fewer compacts and greater protrusions of the compacts; these drilled at faster rates than older-style compact bits in the same formations. (These bits are Nos. 9 through 12 on the K-2 Parker and Nos. 6 through 10 on the K-3 Parker.

5. Sealed bearings in the new com-

shown in drilling two West Texas wells

Bit Record, Pure Oil's K-2 Parker

Bit No.	Size (in.)	Type	Jet nozzle size (in.)	Depth in (ft.)	Depth out (ft.)	Footage drilled	Hours drilled	Weight on bit (1,000 lb.)	Rotary speed (r.p.m.)
1	12¼	OSC-3AJ	13/32	255	2,975	2,720	21¾	60-65	120
2	11	OSC-1GJ	13/32	2,975	3,914	939	21¾	50-65	60-110
3	11	OSC-1GJ	One 7/16 Two 13/32	3,914	4,435	521	16¾	70-75	45-70
4	11	OSC-1GJ	One 7/16 Two 13/32	4,435	4,630	195	14¼	75-85	45-72
5	11	OWC-J	One 7/16 Two 13/32	4,630	4,887	257	16½	85-90	70
6	11	OWC-J	One 7/16 Two 13/32	4,887	5,065	178	5½	80	70
7	7⅞	W7R-2J	5/16	5,065	5,626	561	19	30-45	68
8	7⅞	W7R-2J	5/16	5,626	5,915	289	11¼	35-40	68
9	7⅞	RG-7XJ	One 9/32 Two 5/16	5,915	6,517	602	31¾	35-40	39
10	7⅞	RG-7XJ	One 9/32 Two 5/16	6,517	7,120	603	35	35-40	39
11	7⅞	RG-7XJ	One 5/16 Two 9/32	7,120	7,900	780	45½	30-35	39
12	7⅞	RG-7XJ	One 5/16 Two 9/32	7,900	8,587	687	43¼	30-35	39
13	7⅞	W7R-2J	5/16	8,587	8,854	267	19	50-56	44-65
14	7⅞	W7R-2J	5/16	8,854	9,050	196	11	50	65
15	7⅞	W7R-2J	5/16	9,050	9,100	50	2¾	50	65

BIT RECORD on the first of the two record wells, Pure Oil's K-2 Parker, is four-bit improvement over any other well previously drilled in the field. Record would have been even better were it not that an unusually long intermediate casing string was set.

Bit Record, Pure Oil's K-3 Parker

Bit No.	Size (in.)	Type	Jet nozzle size (in.)	Depth in (ft.)	Depth out (ft.)	Footage drilled	Hours drilled	Weight on bit (1,000 lb.)	Rotary speed (r.p.m.)
1	12¼	OSC-1GJ	13/32	210	3,072	2,862	29½	60-70	110-72
2	11	.....	13/32	3,072	4,070	978	23½	65-75	44-72
3	11	OWC-J	Two 13/32 One 7/16	4,070	4,505	435	18¾	80-90	44-72
4	11	OWC-J (Rerun)	Two 13/32 One 7/16	4,505	4,688	183	15¾	85	44
5	7⅞	W7R-2J	Two 10/32 One 9/32	4,688	4,999	311	15¾	30-45	30-65
6	7⅞	RG-7XJ	Two 9/32 One 10/32	4,999	6,402	1,403	68½	35	39
7	7⅞	RG-7XJ	9/32	6,402	7,070	662	41	30-40	39
8	7⅞	RG-7XJ	Two 9/32 One 10/32	7,070	7,586	516	23	25-30	39
9	7⅞	RG-7XJ	Two 9/32 One 10/32	7,586	8,267	681	40	25-30	39
8	7⅞	RG-7XJ (Rerun)	Two 9/32 One 10/32	8,267	8,561	294	22½	25-35	39
10	7⅞	RG-7XJ	Two 9/32 One 10/32	8,561	8,893	332	33½	30-40	39
11	7⅞	W7R-2J	5/16	8,893	9,100	207	16½	45	30-65

AN IMPROVEMENT over the first well was made on the K-3 Parker. This shaved another four bits off the record. Note that bit 8 was pulled and later rerun. Bit 4 is a rerun of bit 6 from the K-2 well.

pact bits made longer runs than is common for bits without bearing seals. Bit 6 on the K-3 Parker made 1,403 ft. in 68½ hours. At the time, this was the longest run ever made with such a bit.

6. Good hydraulics (including jet bits) were used throughout the holes.

But for two things, the record of the K-2 might have been almost as good as that on the K-3. First, the K-2 set more intermediate casing (5,065 ft.) than was customary in the area; the K-3 set only 4,688 ft. Second, the K-2's last bit might have been eliminated (it had only 50 ft. to drill to reach total depth) had the previous bit been scheduled as a compact type instead of a milled-tooth type. A final compact-type bit was not necessary on the K-3 because the last interval to be drilled was well within the capacity of a milled-tooth bit.

Help from research. The excellent showing made by Ard Drilling on these two wells is a tribute not only to that firm's proficiency in its business but also to the recent research work on drilling operations. There has been a rapid series of advances lately in the knowledge of basic drilling mechanics. Some of these advances helped in setting the Andrews County records.

Probably the most important additions of recent months to drilling technology have been connected with wear of rock bits. First, it was definitely learned what effect bit weight and rotary speed have on the life of bit bearings (see King, George R., "Why Rock-Bit Bearings Fail," OGJ, Nov. 16, 1959). Then, after long research, it became possible to tie down how bit wieght and rotary speed affect the wear of bit teeth (see OGJ, Mar. 7, 1960, p. 84).

With such intricate relations known, it is possible for the first time to "engineer" the "optimum" bit weight and rotary speed in the same exact manner that rig hydraulics have been engineered.

Character of the formations and the drilling fluid have a large part in calculations for optimum weight and speed. Thus, the drilling programs engineered for the Andrews County wells were specific for those locations. For a location not far away, a different program might be in order.

New bits. Bits 9, 10, 11, and 12 on the K-2 and bits 6, 7, 8, 9, and 10 on the K-3 aren't familiar to many contractors. These bits, all identical, combine two important features. First, they are tungsten-carbide-insert (or compact) type bits. The number and arrangement of compacts is designed to cut many formations previously drilled by hard-formation milled-tooth bits. In addition, the cones have compacts on the gage surfaces.

Second, bearings of the bits are sealed. The bearings seal isn't exclusive to this one bit type; it can also be used on bits with different design cutting structures.

Purpose of the seal is to keep drilling fluid out of the bearing and lubricant in. Thus protected, the bearing can be expected to last longer than in an unsealed bit. On bits 9 and 10 of the K-2 well and on bits 7 and 9 of the K-3 well, it is uncertain just how much benefit the bearing seal was; the bits ran only as long as might be expected from an unsealed bit. However, the bearing seal was obviously a big benefit on bits 11 and 12 on the K-2 and bits 6, 8, and 10 of the K-3. These all ran at least 10 hours longer than is common for unsealed bits in the same situation. Some like the bit 6 on the K-3 well (1,403 ft. in 68½ hours) far outdistanced conventional bits. A week later, the same type of bit drilled 1,507 ft. in 60 hours in a hole only a few miles away.

Good over-all practice. Of course, the bit program wasn't the only thing which contributed to the fast drilling of these wells. Other drilling practices had to be good too. One of the most important was good hydraulics.

The rig which drilled both holes has a mud pump which is unusually large for the West Texas-New Mexico area. The pump is an Emsco D-850. At 850 rated horsepower, it is significantly larger than the 650-hp. or smaller models common in the area. The rig also has a separately powered mud-mixing pump.

Jet bits were used from surface to total depth. Circulation rate (with 5-in. drill pipe) was kept high enough for good jet velocities. As a result, even in the very shallow hole, the pump ran against 1,900 psi. And, below the intermediate pipe (with 4½-in. pipe), circulating pressure was often as high as 2,400 psi.

Most of the hole was drilled with clear water, fastest drilling of all drilling fluids. Return flow from the well was run through the reserve pit to drop out all possible solids. Some sodium bichromate was added to neutralize sulfur contamination. At the intermediate casing point, the holes were mudded up to run pipe. After this, drilling with water resumed to around 8,500 ft. where low-solids muds were used to total depths.

Fortunately there is not a severe crooked-hole problem in the area. Still, the drill-collar string was sized to keep hole angles at a minimum. In the 7⅞-in holes, four to six 7-in. collars were used just above the bit; then, 6½-in. collars were used to complete the string. In the 12½-in. holes, 8-in. collars were used above the bit.

WHILE TUBING WAS BEING RUN on the K-2 Parker (shown here), Ard Drilling Co. prepared the drilling program on the next well, the K-3. Experience from the first well made it possible to cut four bits and 3 days on the second.

Acknowledgment

Thanks are due to Noyes Silkwood, tool pusher for Ard Drilling Co., Odessa, and to W. A. "Bill" Kistler, Hughes Tool Co., Midland, Tex., for help in preparation of this article.

Hugoton operators shoot for

LOW-COST WORKOVERS

• Many procedures have been tried in the past, but only a few have been economical. Continued high operating costs make low-priced recompletions a necessity, even with the current high demand for gas. This article reviews the experiences of some Hugoton operators, and gives some worth-while tips on how to save money.

BY R. M. RIPPETOE
AND M. M. SORENSON
Dowell Division of the
Dow Chemical Co.

MOST HUGOTON field wells have been completed in one of two ways: (1) Pipe set through the producing zones of the Hugoton series and perforated, and (2) pipe set to the top of the series with slotted or perforated liners hung through the pay zone.

Shortly after discovery of the field, wells were drilled and completed at a fast rate and few of them were logged. The old-type logs that were made on some of the wells do not provide the good detailed information needed to complete an entirely satisfactory workover.

Logs made prior to workover with modern equipment frequently find additional permeability that should be opened up. This requires an expenditure of $500 to $600 for logging and $1,500 to $2,000 for logging and perforating. Whether logging is necessary or not depends on the amount and validity of information obtained when the well was first drilled.

The producing zones. The Hugoton series is composed of four major zones: Herrington, a sandy lime; Krider, a very sandy lime; Winfield and Fort Riley, both limestone. The Fort Riley contains an upper zone called Towanda.

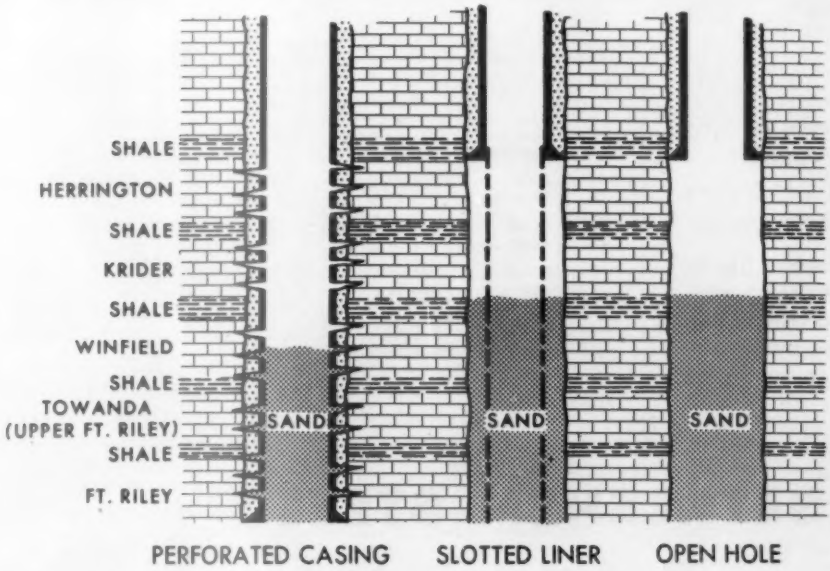
In different parts of the field, gas is produced from various combinations of Hugoton series zones. In some wells, all major zones are open. Operators of these wells believe that the Winfield and Fort Riley zones provide most of the gas produced. It appears that most of the large volume of acid used in the original completion went into these two lower zones.

In other parts of the field, the Fort Riley has watered out and the Herrington, Krider, and Winfield zones are producing. In still other areas, the Winfield and Fort Riley are both watered out and only the Herrington and Krider zones are producing. These producing combinations should be considered in planning a workover.

Fracture treatment tailored. Economics, more than any other factor, dictates the type and volume of fluid used for fracturing in this field. By tailoring the fracturing materials and equipment to each well, stimulation can usually be profitable to operators. Hugoton wells generally respond to stimulation with good increases in deliverability.

On completion, these wells were acidized because the Hugoton series is highly soluble. Acid alone, however, no longer stimulates these wells with lasting success. Many acid-base fracturing fluids have been used in this field, but response has not justified the additional expense. As a result, most recent jobs have used fresh water. Volumes between 60,000 and 100,000 gal. of water have produced good results. Water alone is an inefficient, though inexpensive, fracturing fluid, so sand has been added at the rate of 1 lb. per gal.

On several jobs, fluid-loss agents have been used to make water a more efficient fracturing fluid. These additives have enabled operators to reduce



SAND IS USED to fill the well to the top of the lower perforations, regardless of the type of initial completion. Where perforated casing is in the hole, ball sealers may be used to divert the fracturing fluid. Fig. 1.

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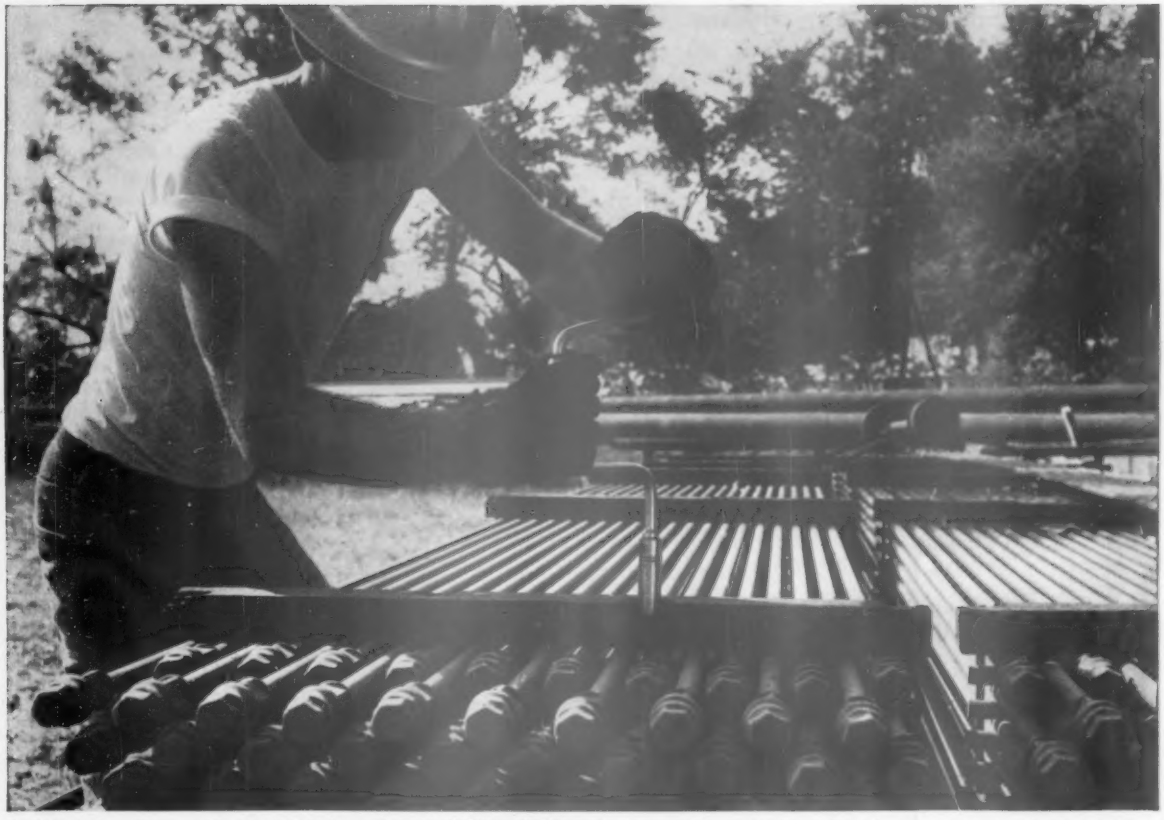

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Rod	Type	Heat-Treatment	Yield Point-psi		Tensile Strength-psi	
			Min.	Av.	Min.	Av.
X2	Carbon-Manganese	Normalized	65,000	72,000	93,000	100,000
X Mayari	Nickel-Chromium	Normalized	60,000	65,000	90,000	95,000
46	Nickel-Molybdenum	Normalized and Tempered	67,000	75,000	82,000	90,000
43	Nickel-Chromium-Molybdenum	Normalized and Tempered	100,000	110,000	120,000	130,000
41	Manganese-Chromium-Molybdenum	Normalized and Tempered	100,000	110,000	120,000	130,000

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TABLE 1—RESULTS OF FRACTURE TREATMENT OF SEVERAL WELLS IN HUGOTON FIELD

Date of Treatment	Intermittent perforations From	To	Shots per foot	Plugback TD	Gal. of water inc. flush & preflush	Pounds sand	Inj. rate bbl./min.	Maximum pressure psi.	Method of diversion	Deliverability in M.c.f. Before	After	72-hour shut-in pressure psi. Before	After
11-12-58	2,335-2,424		6	2,440	105,000	100,000	80	1,400	Plugback with 3,100 lb. sand	445	2,134	334	*349
7-18-58	2,392-2,525		4	2,525	86,000	80,000	64	2,200	Plugback	533	2,217	314.5	*354
7-16-58	2,365-2,500		4	2,500	84,000	80,000	72	0	Plugback	690	2,309	365.6	*377.2
1-24-59	2,335-2,525		..	2,360	94,000	80,000	67	800	Plugback with 6,000 lb. sand	403	1,427	314	*328
									After 6 months	...	2,253	....	*343
7- 1-57	2,326-2,540		..	2,417	100,000	None	100	670	Plugback with 3,900 lb. sand	475	1,050	360	340
12- 1-59	2,371-2,595		2	2,596	100,000	96,000	51.3	1,600	320 balls	878	1,823	366.7	344.7
11-13-59	2,479-2,739		6	2,744	97,000	75,000	69	400	450 balls	705	2,305	352.7	338.7
12-31-59	2,485-2,724		2	2,730	100,000	97,000	63	600	415 balls	983	3,749	352.25	349
12-22-59	2,445-2,713		6	2,720	92,000	94,500	69	400	360 balls	782	2,667	351.1	347
12-28-59	2,448-2,691		6	2,691	92,000	81,000	68.8	1,000	330 balls	786	2,742	356.6	348
2- 1-60	2,473-2,678		..	2,678	98,000	100,000	67	700	800 lb. rock salt		No Test	Made	
2- 1-60	2,460-2,711		6	2,728	95,000	100,000	68.5	800	420 balls		No Test	Made	
11-22-59	2,451-2,697		6	2,699	100,000	86,200	57.2	500	490 balls	674	2,146	354.2	340.4
10-25-58	2,464-2,606		5	2,615	100,000	120,000	57.6	975	350 balls	1,241	3,319	330.5	*356.4
12-20-57	2,495-2,630		4	2,630	100,000	100,000	61.4	400	Plugback with sand	3,265	4,126	341.0	333.5
									After 2 years	...	3,903	....	332.9
7-10-59	2,578-2,718		Slotted liner	2,718	60,000	60,000	58	....	Plugback	397	2,106	No Test	Made
7-10-59	2,511-2,600		Slotted liner	2,600	60,000	60,000	75	....	Plugback	627	1,476	....	.....

*The increase in rock pressure indicates that new area of drainage was opened up.

the volume of water required for fracturing treatment, and the results have been equivalent to those obtained on large-volume conventional treatments.

Savings have resulted by reducing initial cost of hauling and storing water, and shortening well down time. Less water injected into the formation means faster cleanup and less gas vented before the well is ready to be returned to the line.

Field procedure. Most wells with more than one zone open have long perforated sections or liners. Whenever possible, the liners are left in the well during fracturing, since pulling them is often difficult.

To fracture the Herrington and Krider zones effectively, some method of diverting the fracturing fluid must be used. This is usually done in one of three ways:

1. Plugging back by lubricating Ottawa sand into the casing, allowing it to fill up past the bottom zones—regardless of open hole, uncemented liner or perforated pipe Fig. 1.

2. Plugging back with sand, as above, and using ball sealers to divert fracturing fluids.

3. Injecting rock salt into the fracturing fluid in slugs of approximately 2,000 lb.

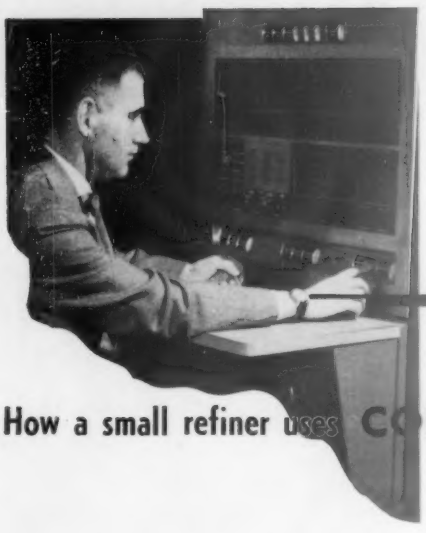
Equipment should be selected carefully to produce the best results from a fracturing job. High injection rates are necessary. Injection pressures will range from 0 to 900 psi. down 7-in. pipe and from 800 to 1,600 psi. down 5½-in. pipe. Usually, injection rates between 65 and 75 bbl. per minute are desired down 7-in. pipe and between 45 and 55 bbl. per minute down 5½-in. pipe.

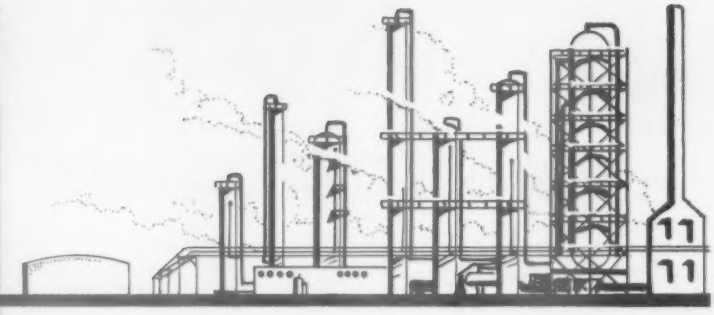
A sand truck, called a "Grasshopper," was designed especially for plugback work in Hugoton field, Fig. 2. It hauls sand to the location and elevates it into the lubricator atop the well casing. A measuring line to measure sand fillup is mounted on this truck.

THIS GRASSHOPPER was designed in the Hugoton area to help load the wells with sand prior to fracturing. The sand is used to control the point of application of fracturing fluid. Fig. 2.

How much? The total cost of a fracturing job using 100,000 gal. of fresh water and 100,000 lb. of sand is usually under $5,000. This includes materials and equipment and water hauling. Many operators plan two or more fracturing jobs on the same trip for additional economy.

After completion of the fracturing treatment, the well is shut in and allowed to pressure up. Then it is alternately blown and pressured to kick off and unload the water and sand plug. A new Dowell foaming agent, G2, is often used to speed cleanup and help the well kick off faster. After cleanup, the well is ready to be tested and put on the line. Deliverabilities of many wells treated in this manner have been doubled, tripled, and even quadrupled, Table 1. Bottom-hole pressures have actually been increased in some wells, indicating that new areas of drainage were opened up. Payout time is about 12 months at the present rate of production. The ratio of successful jobs to failures has been quite high.





How a small refiner uses computers to select crude

By getting as close to a foolproof cook-book method as possible, Ingram Oil & Refining Co. is getting good, accurate answers with a minimum of personnel.

BY J. A. O'NEILL, JR.
AND C. B. WHYTE, JR.
Ingram Oil & Refining Co.

CRUDE SELECTION is a significant economic problem, and one that recurs frequently for Ingram Oil & Refining Co. The problem is accentuated because, while we have refining, transporting, marketing, and retail facilities, we have no crude production.

It is imperative that we have a method which is as accurate as possible for comparing crudes available for purchase one against the other and also against those now being run. Further, it is important that we do this with a minimum technical staff and in the shortest time possible, so that the information will be available in time to be of practical value in making decisions affecting crude supply.

We entered the computer field on a trial basis to see if it were possible to get useful results with a limited staff and without the cost exceeding the value of information obtained. In our case, we have profited by:

- **Standardizing** the problem structure and
- **Developing** "library" sections of the problem, so that a gradual shifting of nontechnical personnel to this work is possible, as some of the complications are picked up by the computer.

Crude-Selection Method

During the first phases of crude selection, we tried several approaches which have gradually evolved into our present method. In our first approach, crudes were hand-composited according to groups. This was extremely time consuming, since if a single crude were removed from the group, all of the compositing had to be repeated. Since no general method was set up, each crude-selection problem was treated separately, being related to others only by fixed operating data of the refinery.

It became apparent that with our limited staff the work must be systematized, as most of the time was being used in preparing base data and only a small part in analyzing results. Consequently, the effectiveness and usefulness of the program were seriously curtailed.

It was decided that fewer problems should be run and that we would use this time instead to obtain and improve data for one section of the problem at a time, until that part could be proven correct within reasonable limits. Meanwhile, generalized data would be used for the remainder of the problem.

First item investigated was gasoline-component ratings to permit good predictions of gasoline blends. Refinery units were operated for short periods of time set conditions to obtain stream samples of low vapor pressure and controlled distillation range, while operating on a crude composite considered average.

Several problems were run and resulting blends were checked in the laboratory using the components obtained during this run. Blending numbers were then adjusted by correlating with predictions. This procedure was repeated until we were able to predict octane ratings to within plus or minus one-half a number and vapor pressure to within three-tenths of 1 psi.

Second item was to establish an easy method of compositing and preassigning crudes.

A set of input data was developed for a matrix by vector multiplier code. This code accepts data input identical to that used in the linear program. The matrix is assembled by a restriction generator in the same manner as if it were a simulation problem.

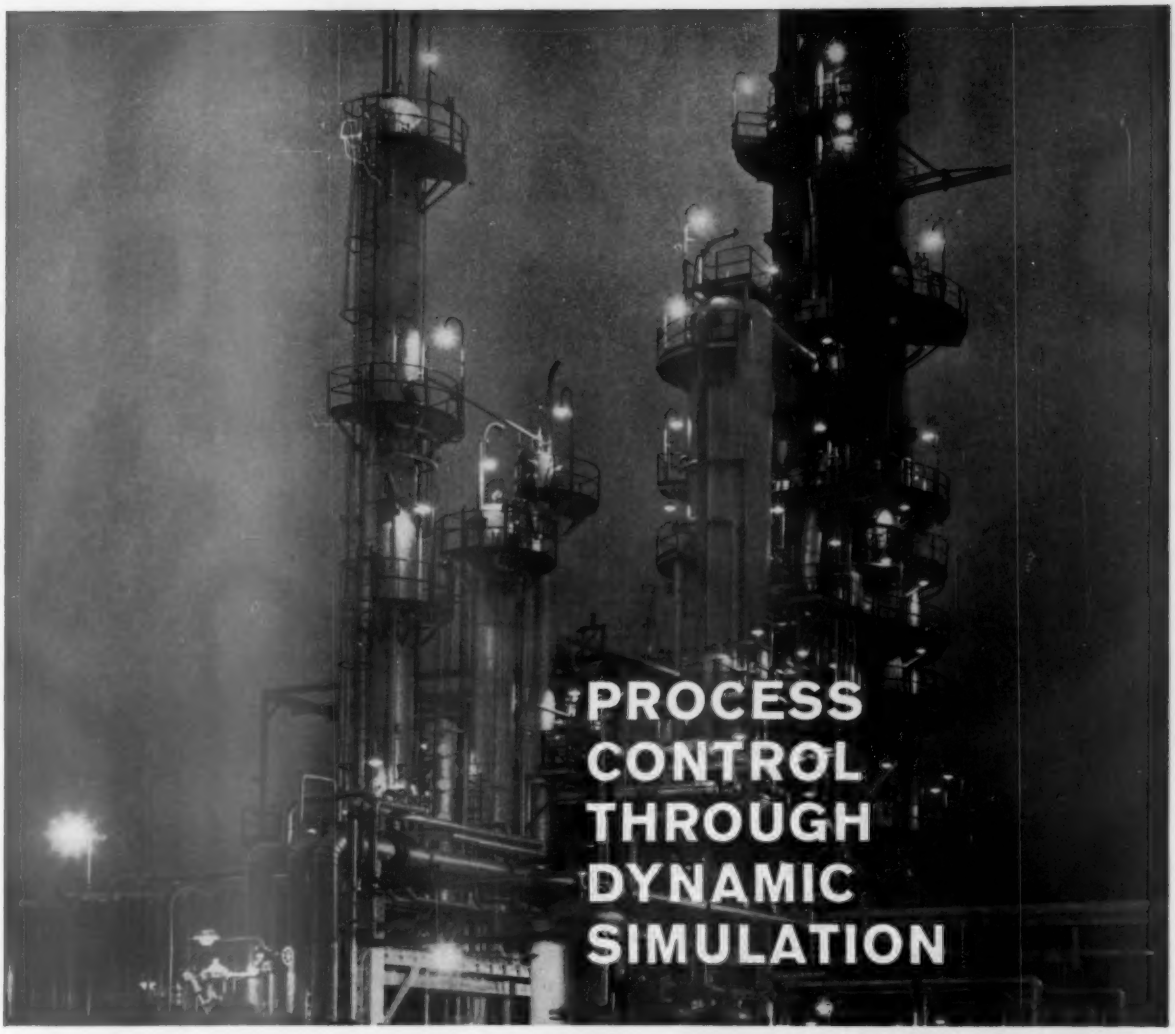
Further, it contains several output options which allow reloading output as data to itself, provides direct listing on a columnar IBM 407 report-writing panel, and is usable as direct input to the main program.

Since we were at the time running some 20 crudes, development of this input took several weeks of almost all available time as well as a large amount of laboratory work and outside analysis to reduce all of the crudes to an identical basis for comparison.

This matrix allows any combination of crudes to be composited for preassignment to a problem in about 5 minutes of IBM 650 time for loading plus 1 minute per composite in computing time. No technical personnel are required, and input cards for the remaining crudes can easily be sorted out for direct inclusion as input.

Third section studied was the blending of middle distillates. This has, so far, resulted in the inclusion of four average blends of different components for making No. 2 fuel oil,

Presented to WPRA computer conference, Houston.



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with the option to make any or all to the limit of No. 2 oil allowed, and one blend each for two grades of diesel fuel.

Since we are still running some 20 different crudes and distillates, each of which has different pour point and diesel index, it is obviously not easy to say what comprises an average blend. Therefore, some work has been started on the correlation of the blending qualities of middle distillates from various crudes with each other, as well as an attempt to tie these characteristics to other qualities such as naphthene and aromatic content. This phase is so far inconclusive.

Concurrently with the development of these "library" sections of the problem, a basic structure for the mathematical model has evolved from experience with the problems run. This model defines the restrictions and flexibility of the refinery in terms of equations and variables and is used for the linear - program optimization.

First, a word about our process units.

Refining Scheme

Ingram operates a 20,000-bbl. per calendar-day refinery located on the Mississippi River 10 miles below New Orleans. Basic units used are:

1. A 14,000-bbl. per day atmospheric-distillation unit, called a crude unit, designed to process 25° to 40°-API South Louisiana crude.

2. A second atmospheric-distillation unit, called the condensation unit, for the processing of 40° to 55°-API condensates.

Stocks from these units are:

1. Full - boiling - range straightrun gasoline which is sent to a fractionator to prepare a naphtha charge for a 4,000-bbl. per day Platformer with associated gas - recovery units. Stocks produced here are butane, light straightrun, medium naphtha, and various octane reformates.

2. Kerosine and distillate cuts which are caustic-treated and sent to storage.

3. An atmospheric-gas-oil cut which is sent to storage.

4. Reduced crude which is sent to a 7,500-bbl. per day vacuum unit.

Reduced crude is broken by the vacuum unit into light and heavy-vacuum gas oils and bottoms. Light and heavy-vacuum gas oils are combined with atmospheric gas oil and provide feed for a 6,000-bbl. per day fluid catalytic cracking unit with associated gas-recovery and polymerization units. Stocks produced are butane, polymer gasoline, FCC gasoline, and light cycle and slurry oils.

Final products from these stocks are:

1. LPG as a direct product.

2. Premium and regular gasolines blended from gasoline stocks, plus some purchased components.

3. Kerosine as a direct product.

4. Two grades of diesel fuel blended from kerosine and distillate.

5. No. 2 fuel oil blended from kerosine, distillate, and light-cycle oil.

6. No. 6 fuel oil from total vacuum-tower bottoms plus slurry oil.

The original problems were to be set up by three of the five engineers in the organization in addition to their other duties, making time alone an acute problem. This has proved inadequate and has gradually changed to full time for one engineer plus as much of the time of another as can be spared from administrative duties. Some help in process analysis is available on special problems. Nontechnical personnel are used to run routine problems.

Bonner & Moore Engineering Associates were also engaged and it is the application of their programs which is described in this paper.

Mathematical Model

Basically, the mathematical model contains, in addition to the items already mentioned, the following generalized processing options:

1. Data for six severity operations of the Platformer.

2. Cut-point options are:

(a) Reformer charge to be diverted to kerosine.

(b) Medium naphtha to be diverted to reformer charge.

(c) Distillate to be diverted to atmospheric gas oil.

(d) Light-cycle oil to be diverted to slurry.

3. Two levels of severity for the catalytic cracking unit at 50% and 70% conversion.

4. All blends previously mentioned in addition to option to purchase outside blending stocks and TEL data for each blend of gasoline.

Limits are imposed on various units according to significant factors in their operations. Examples are:

1. Two limits based on the gasoline and reduced - crude fractions in the crude unit, in addition to a throughput limit imposed regardless of crude composition.

2. A reduced-crude or bottoms limit as well as an absolute throughput limit on the condensate unit.

3. A capacity limit for the reformer which is modified by the program to correct both for the severity of operation and the quality of the selected feed stock based on naphthene and aromatic content.

4. A coke-burning limit for the FCC unit. This is the total rate at all conversion levels.

5. A limit on foreign crude consumption if run.

Also, certain limits are placed on products, according to marketing restrictions.

In addition to operating characteristics, other special options are allowed by transfer equations. These allow for special considerations which may some day prove profitable.

Examples are:

1. An option to split FCC gasoline at a cost equivalent to a reasonable payout for construction of a unit to accomplish this cut.

2. A transfer at a penalty for the production of gasoline and middle distillates in quantities over base quantities allowed at prevailing prices.

3. Equations allowing for special characteristics of crude oils such as lower-than-average octane for straight-run components, poor middle-distillate blending qualities, etc., to be inserted in the base problem at will.

These items comprise the base problem structure and have so far not been changed, except when it has been necessary to add to the problem. When we want to eliminate any item from the solution, the computer processes a single card, which either prices out or restricts the quantity of material in question.

The requirements for a problem suited to almost any general set of circumstances, therefore, remain always in the mathematical model and very little technical time is required to set up a problem. Generally, a problem can be set up by this method and run in 3 days or less.

We realize, of course, that the solutions are not nearly perfect for at least three reasons. The first of these is insufficient data. We are correcting this as fast as possible, taking the more important areas first.

Secondly, while we realize that more data in some cases would improve the results, we feel that we would add either complexity to the problem out of range of the improvement to be gained or that the development of a method for adding some information would take more time than is justified. Therefore, to preserve the ease of setting up problems, these improvements may never be made.

As an example, the method used to divert one cut to another is based on a straight volume percentage to be

diverted for a change in cut temperature. No allowance is made, say, for an increase in quality of the medium-naphtha cut if part of it is diverted to reformer charge. This, of course, would increase this component's blending value. At the same time, there would be an offsetting decrease in the quality of the reformer charge.

We feel the small improvement that would accrue from a more detailed representation of these quality changes is not justified by the complications involved. Such complications could result in a 20 to 100% increase in problem size with net adverse effect on our primary aim which is, of course, automation.

Future Aims

Our plans for this program do include addition of more data, when we feel it has been checked and proved to be significant. For example, we hope to arrive at a simple method for at least a rough evaluation of the cat cracker feed portions of crudes which can become a part of the basic problem.

However, our primary aim at the moment is to get a foolproof problem structure that can be completely set up and run by nontechnical personnel for any set of ordinary circumstances. The linear program we have described occupies a matrix of about 50 by 60, not counting crudes added for comparison. This requires the use of an IBM 704 to compute the optimum solution efficiently.

The model has been carefully constructed so that parts can be removed without affecting the basic structure except in regard to flexibility of choice, thereby bringing it down to a size compatible with the IBM 650 computer. This will allow the use of available technical manpower for running complete problems on the 704 to establish an over-all accurate picture which reflects market and operating conditions.

The solution to this problem will then be used for preassignment of some of the less-critical items to the more simplified 650 problem, allowing one or two outside crudes to be compared rapidly with those being run in the refinery at any given time. At least sufficient accuracy will be maintained to determine if they require more detailed study in the larger model.

This, it is hoped, can be accomplished on a "cook-book" basis by personnel with a minimum of special training. Because of greater availability of the smaller computer and an increase in people to set it up, this procedure should reduce analysis time from 3 days to a matter of hours, thereby greatly increasing its flexibility and usefulness.

We feel that this method cannot, in fairness, be compared to our former methods of "hand" evaluation of crudes. The very size of the problem made more than a cursory comparison by hand methods impossible in a reasonable time.

Even without the improvements which we recognized can be added, we believe that we have cut our margin of error from about 10 to 20 cents per barrel to about 2 to 5 cents per barrel, with no more time than was originally required to run out the problem by hand.

Additionally, we have acquired some other useful, though intangible, benefits. We have greater confidence in the solutions because we have more detailed information with which to justify decisions. Further, shadow-price information from problems run in the same environment is useful for a quick indication of the value of a crude or other stock.

Development of the crude matrix has given us a tool with which we can composite the contents of crude tanks on a routine basis before they are cut to the units, so that their composition can be checked by yield rather than by gravity alone as in the past. This also allows, in a few minutes, projections of product yields for a week, a month, or several months, as required.

LEASE TIP

Portable spray pump useful on lease

THE PORTABLE spray unit shown here is a handy thing to have around the lease.

Easily attached to a trailer hitch on the pumper's car or pickup, the unit can be used for spraying weed killer, solvents, etc.

Weed control is simple. The unit is towed to the area needing attention, the chemicals are mixed in the drum, and the gasoline engine started to drive the pump.

Cleaning tanks, pumping units, and other equipment prior to painting is an easy job with this unit also. The drum is filled with the proper solvent, and the surface to be painted is easily cleaned of grease, oil, and other materials that must be removed.

3,500 FEET PER DAY FOR 36-INCH PIPE

Cleveland 320 cuts trench 6 ft. deep, sloped to 5 ft. wide to speed lowering in muddy going

On a 39-mile natural gas line across New Jersey the H. C. Price Co., with a locally recruited crew having a minimum of pipeline experience, stayed well ahead of schedule. Plagued by rotten weather, Price's rookie crew laid an average 3,500 feet per day of heavy pipe (5 tons per 40′ length). Digging 6′ deep trench 50″ wide sloped to 60″ at the top, in a muddy right-of-way, their Cleveland 320 easily stayed ahead of the pipe gang.

For real trench production there's nothing like a Cleveland. On tough assignments like this Price job or on ordinary ones, Clevelands deliver trench on time, all the time. The big 320 makes money on smaller diameter lines too, producing high daily trench mileage.

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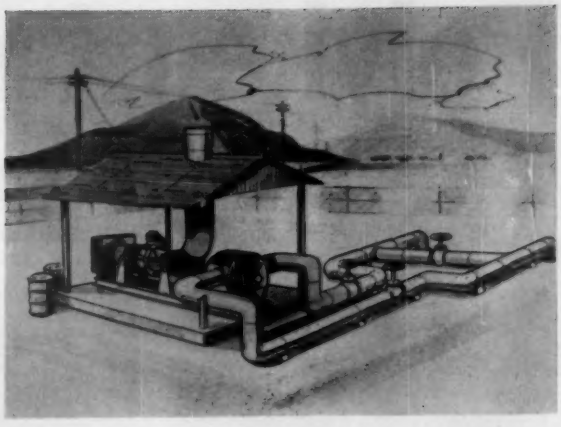
On the Job
PIPELINING

Turbine centrifugals set for field booster service



LIGHT, compact station needs little foundation, no water.

THIS FALL, Trunkline Gas Co. will accept delivery of an 825-hp. gas-turbine centrifugal compressor unit occupying little more space than an executive office desk, and weighing less than 5,000 lb.

Trunkline intends to evaluate this and a similar unit for use in groups of units for main-line stations (OGJ, Jan. 25, 1960, p. 120). Such compactness and low weight also offer possibilities for gas-field booster applications. Besides being readily portable, these small lightweight units require practically no permanent platform or foundation, no water, and lend themselves well to remote operation.

The builder of the compressor for one of the two Trunkline units (De Laval Steam Turbine Co.) is planning a line of such compressors to cover much of the range of gas-field booster requirements. The compressor inlet and outlets ports will be 6 in. in diameter. The unit is designed for 457 inlet c.f.m. and pressures of 593 psia. at inlet and 920 psia. at discharge. This compressor is less than 36 in. in height, width, and length.

The General Electric gas turbine which will drive the compressor packs its 825 hp. in an envelope 17 in. in diameter and 60 in. long. There are no gears, since the compressor is direct-driven by the turbine. So the envelope size of the entire unit is under 10 by 4 by 3 ft. Solar Aircraft Co. is building the turbine and compressor for the second Trunkline unit.

Centrifugals vs. Recips

Economy dictates that the permanent or otherwise unsalvageable part of a temporary installation be minimized. Smaller, lighter units require less in the way of unsalvageable pad, or foundation, or platform. This is particularly important on soft ground or offshore; Gulf platforms run up to $70 per square foot, so the smaller a unit the better.

Since centrifugal units have practically no vibration compared with reciprocating installations, they require less foundation mass. Steady rather than pulsating output eliminates heavy, bulky pulsation bottles and piping. Thirdly, the gas turbine and compressor require no water.

Fuel costs for such stations will probably be higher than for reciprocating installations, since the gas turbine's thermal efficiency is lower than that of a gas engine (though at 22% it is still a respectable figure). Trunkline is planning to install a waste-heat-powered-turboexpander along with its gas turbine-compressor units, and will thus increase over-all efficiency. It is unlikely that this additional equipment would be used in the gas fields, however.

Trunkline's study and much experience elsewhere indicate maintenance should be considerably less for rotating than for reciprocating units because of their simplicity, with essentially only one moving part: a single continuously spinning rotor.

Lubrication will be simple and there will be no significant oil consumption. No lubricant will be carried into the gas line. There will be no cooling-water corrosion problems, and no cold-weather protection will be needed.

While some reciprocating units are operated without full-time attendance, gas turbine-centrifugal compressor stations ought to lend themselves even better to remote operation. The units will all have automatic controls, and inspection and maintenance visits can be less frequent than those required by reciprocating stations. For example, there are no lubricators to refill, pockets to be opened or closed, nor valves and ignition plugs to be changed.

Speed and Size Characteristics

At first glance, speeds of the order of 20,000 r.p.m. may seem a drawback to those accustomed to the low speeds of reciprocating units. But it isn't revolutions per minute that count in determining wear and stress, but peripheral speeds.

Because of the small size of these compressors their rotor peripheral speeds, bearing surface speeds, and stress in rotating parts, will actually be lower than those of the slower-speed but much-larger centrifugal compressors which have proved themselves in years of service on pipelines and in refineries, and in many other industries.

Many supercharged low-speed reciprocating units in pipeline service have turbosuperchargers that actually operate at close to the speeds of the new turbine-driven compressors.

For flexibility, barrel-type compressors have been designed. These have standardized shells or cases with which a variety of combinations of standard diaphragms, impellers, and inlets and outlets, can be used to vary performance values. The case or shell takes full operating pressure, but the internal components are exposed only to the pressure differential between inlet and outlet. A forged shell, with cast internal components, will be used.

There will be standard cases which can accommodate from one to four compression stages. Compression stages can easily be added or exchanged at any time to match field conditions. Working pressure of up to 1,400 psi. is presently planned for, with pressure ratios of 1.15 to 2, capacities from 300 to 1,100 c.f.m., speeds from 18,000 to 23,000 r.p.m., and horsepowers from 400 to 1,500. These are not absolute limits; the line can be expanded to include other values if required.

First cost of units is expected to be competitive with reciprocating units of equal rating. This may not be true for extremely small units, but for field booster stations of 400 to 600 hp. and up, the gas-turbine-driven centrifugal compressor will cost no more to install, and less to operate and maintain. The compressor will also be available for drive by reciprocating engines, using a stepup gear for such packages.

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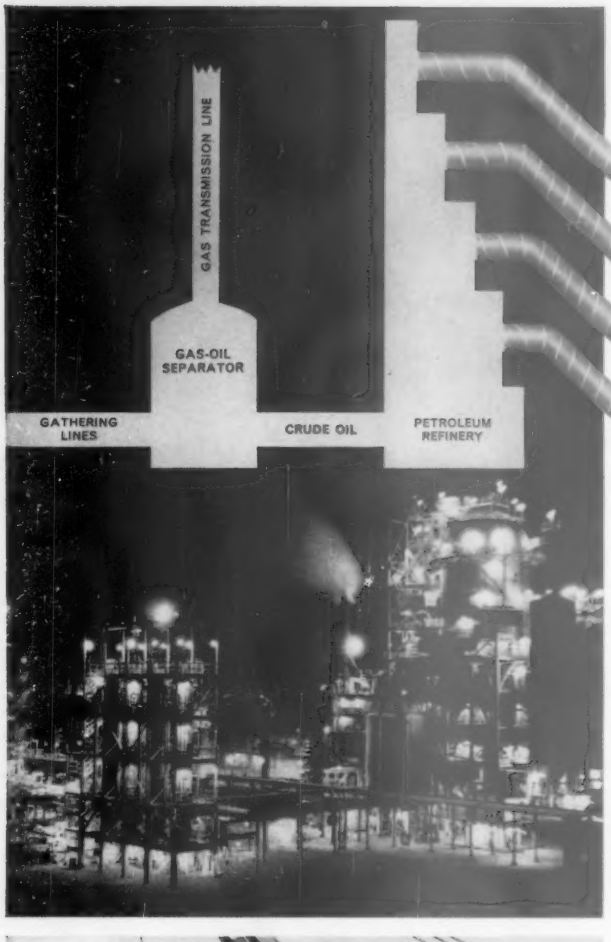

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Safety in hot tapping pipelines and storage tanks

BY R. A. (BOB) GRIFFITH
Pipeline Supervisor,
Valley District Pipe Line System,
Tidewater Oil Co.

CONNECTIONS to pipelines may be made in several ways, depending on how critical is the down time.

If it is not practical or economical to remove the pipeline from service, the connection can be made by hot tapping.

Hot Tapping Pipelines

First consider the pipeline on which the hot tap is to be made. Is the line yours? What is the fluid in the line—low or high-gravity crude, gasoline, or natural gas? Is the line in high or low-pressure service?

The answers to these questions are of primary importance in selecting the proper procedure, flange, valve, and other fittings. Improper fittings could rupture under pressure and result in injury or death to a workman.

Secondly, flow of fluid past the point of connection is necessary to carry away the heat encountered during welding. Arc-type welding is generally used for this purpose to eliminate as much heat as possible.

Before welding the fittings to hold the hot-tap machine, the distance of travel of the cutting tool is checked. This determines the length of nipple to be used. The over-all distance from pipe to outboard flange should be double checked before placing the hot-tap machine in position.

There have been instances wherein it was impossible to complete a hot job because distances were not checked and the cutter would not extend into the pipe interior. Should this happen, it may be necessary to leave the hot-tap machine in place for quite some time until the line can be relinquished. Distance between pipe wall and flange also must be adequate to allow bolt installation for flanging up the valve. Pipe-wall thickness should be verified as sufficient for welding without burn-through.

Upon completion of welding on the stub, it may be desirable to apply a hydrostatic test to the welded connection. This depends on application and field conditions.

The gate valve is then hung on the stubbed flange, taking care to remember the flange gasket and make sure all bolts are secure. If connections are not tight, immediate down time and water flushing may result.

The hot-tap machine is placed in position, secured, and made ready for cutting. The gate valve is opened (this oversight has resulted in numerous valve disks being bored through). The cutter is placed in operation, driven either by a manually operated handle or a d.c. motor taking power from the welding machine. Extreme caution should be used to avoid cutting through the opposite side of the line.

Upon completing the cut, the cutter is backed out and the gate valve closed. The hot-tap machine is removed and the biscuit is checked to make sure it did not fall into the fluid stream.

Hot Tapping Tank Shells

Hot tapping of storage-tank shells to install undershot connections without taking the tank out of service is becoming more of an everyday occurrence. In performing a hot tap on a tank shell, we use a standard-type API tank pad and nozzle complete with proper flange rating. The pad and nozzle should be located at least 6 in. from adjacent riveted sections to alleviate possible seam leakage due to heat concentration. Caution should also be exercised in locating the undershot nozzle regarding any interior wooden roof supports immediately adjacent to the shell.

Before welding the nozzle and pad to the shell, the fluid level which we have established should be at least 7 to 14 ft. above the welding location. This fluid height is dependent on product in the pressure vessel. The area should also be checked for gas vapors with a combustible-gas analyzer.

Welding methods. Actual welding of the nozzle and pad has been done by different methods:

1. By beveling the nozzle neck and welding it to the shell first. The reinforcing pad is slipped over the nozzle and the root pass is fused to both shell and nozzle. If an inside seal pass is made, it must not be projected beyond the face of the nozzle. This area should be cleaned to eliminate any possible damage or breakage of cutters on the tapping machine. The unit is then welded solidly to the tank shell. The flange is next welded to the nozzle. Care should be exercised as to length of the nozzle based on the distance of travel of the cutter.

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2. By welding the reinforcing pad to the shell first and then welding the nozzle, being sure to have enough clearance to allow for a good root pass. This procedure will allow the flange to be welded on the nozzle outside the tank area.

3. By using split reinforcing pads. This requires more welding and of course results in more heat.

These pads are drilled and tapped to allow gases or moisture to escape and to test the weld if desired.

Upon completion of welding, the procedure in hot tapping the tank shell is the same as that previously outlined in pipeline hot tapping.

Hot taps near fluid level. We recently used a "gimmick" for hot tapping a tank where the fluid level was such that it did not, in our opinion, allow safe oil height above the proposed work area.

We were trying to pull down a 55,000-bbl. tank to minimize storage and the only suction to the tank was a large swing-type suction which was restricted on minimum suction height. The remaining oil level was too high to allow removal of the manhole cover for pullout, so we decided to hot tap below but near the fluid level.

We made up a second manhole-cover plate in such a manner that it would be rather saw-toothed in appearance with blunt points staggered to coincide with alternate bolt locations on the existing manhole. We then welded on the nozzle and flange to the home-made manhole cover. Every other bolt was next removed from the existing cover, and the newly made cover plate was put in place with a gasket over the existing plate and bolted in position. We then hot tapped through the double plate, allowing pulldown of the fluid level.

Hot-Tapping Objectives

In summary, here are what I believe to be the main objectives to be adhered to in hot tapping:

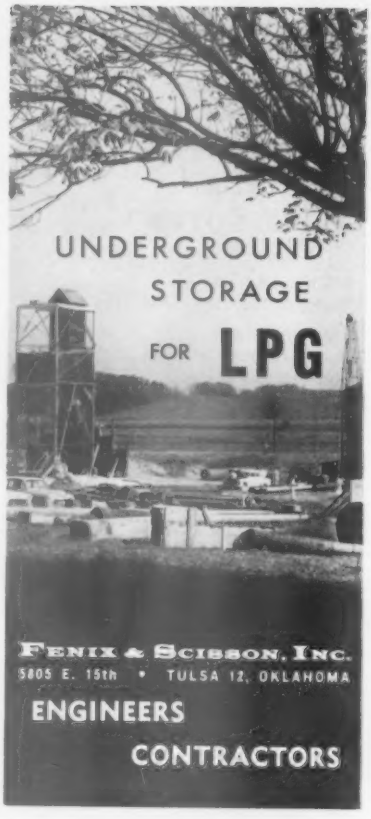
1. Knowing the conditions—making sure of the pipeline to be hot tapped, type of fluid, pressures, and condition of pipe.

2. Job planning—being sure everyone is properly instructed and oriented and equipment is laid out and checked. Don't be afraid to double check connections, measured distances, etc.

3. Above all, don't get in a hurry. Often when a crew starts rushing to complete a job by quitting time, things become slipshod and trouble begins.

Acknowledgment

From a paper presented before the 1960 San Joaquin Valley Oil Industry Safety Conference, Western Oil and Gas Association, Bakersfield, Calif.



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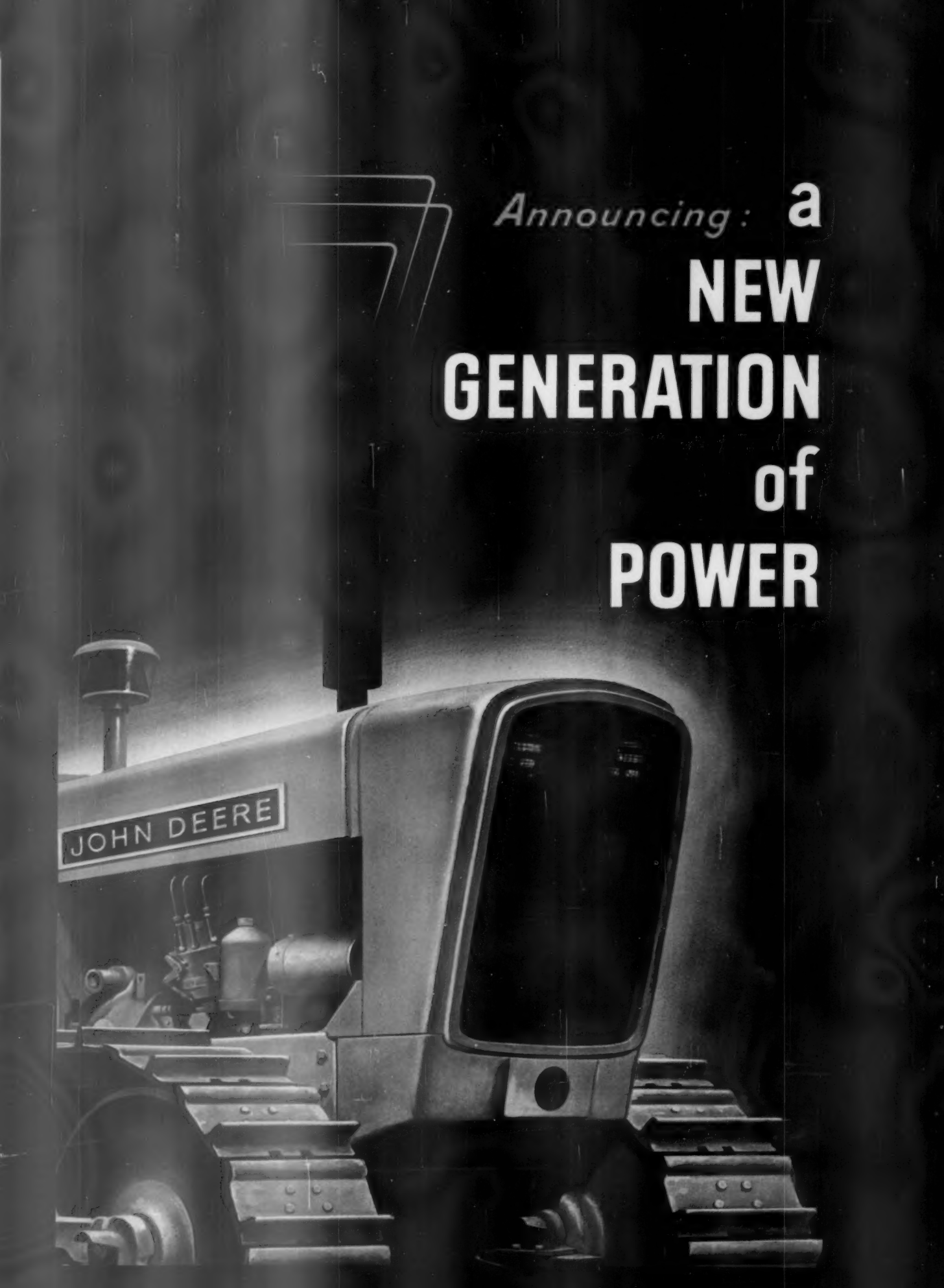
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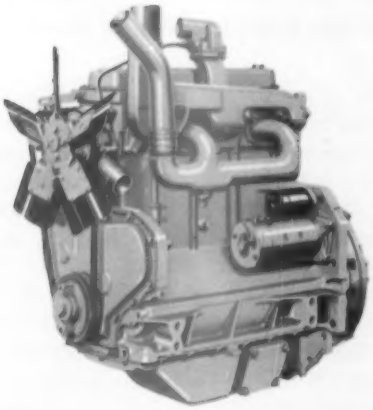

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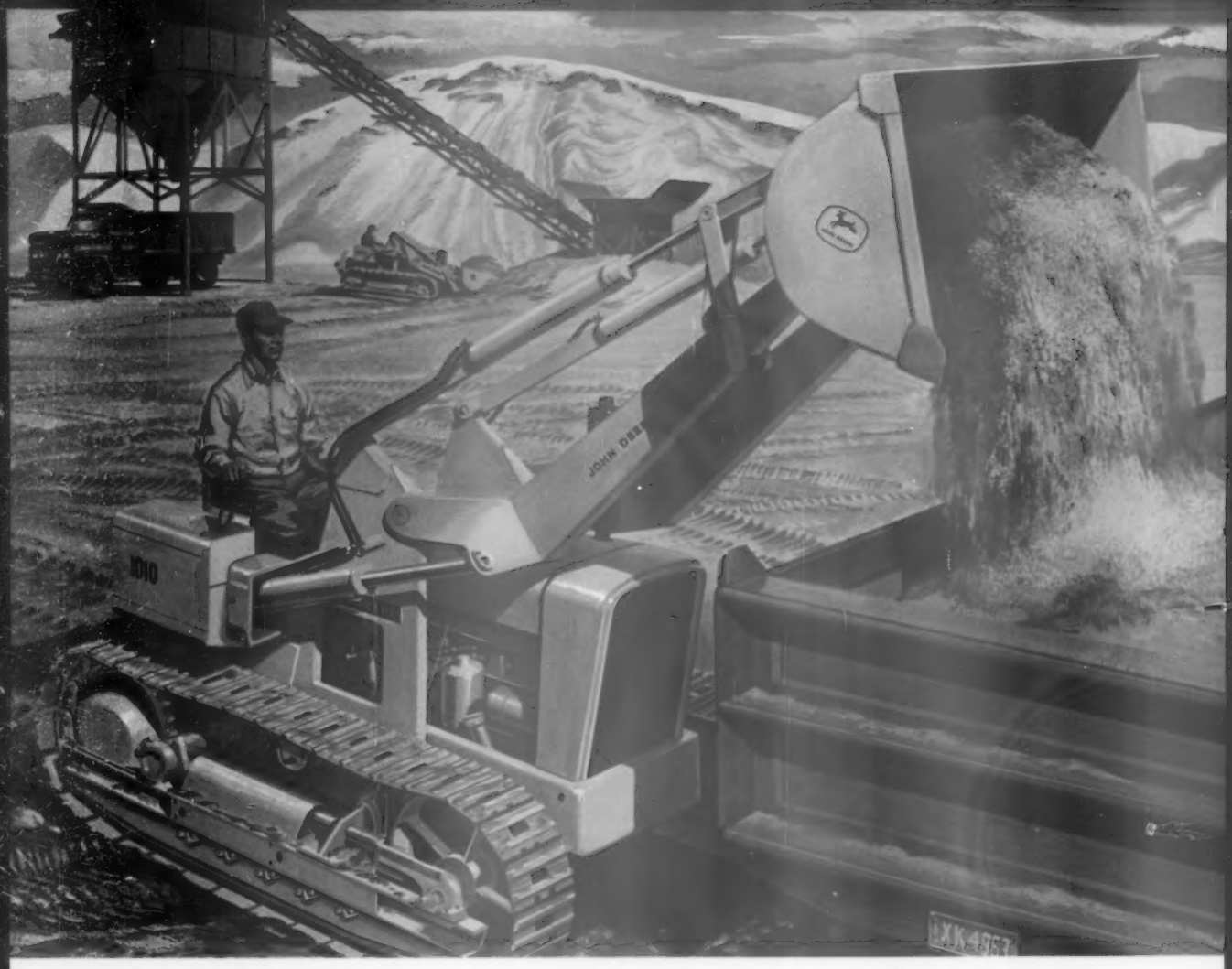

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Powered right for high performance, the John Deere Ten-Ten Crawler-Loader meets all modern demands for a versatile, efficient unit in the 40 engine h.p. class. Sixty-six inch bucket has a rollback of 40 degrees, 8500 pounds breakout force, a full-height lifting capacity of 3500 pounds, and a dumping clearance of 8 feet, 1 inch. The Ten-Ten Crawler-Loader has a 3/4-yard bucket with 8 nodular iron teeth and is available with gasoline or Diesel power.

With extra capacity for top production, the all-new Twenty-Ten Crawler-Loader combines the 50-h.p. John Deere gasoline engine with a one-yard bucket. Fast cycle time is assured by the 40-degree rollback of the 66-inch bucket, 8500 pounds breakout, 3500-pound full-height lifting capacity and a 7-foot, 11-inch dumping clearance. Eight nodular iron bucket teeth speed excavating work in rock, frozen ground or other difficult operating conditions.

4 Wheel Loaders for greater job profits

A wide range of power matched bucket sizes, each with plenty of dumping height and pry-out power assures you the kind of loading performance you need. Whether your job calls for tracks or wheels, choose John Deere for new power and high productivity.

Valuable on any job, the compact 701 Loader for John Deere Ten-Ten Wheel Tractors has a standard 3/8-yard bucket, four feet in width, with a 20-degree rollback providing 4800 pounds of breakout force, 2000 pounds full-height lift capacity, and a dump clearance of 102 inches.

Low-cost loading is yours with the economy priced 700 Loader which mounts on either Twenty-Ten or Thirty-Ten Wheel Tractors. Bucket size is 5/8 yard. Breakout force is 4800 pounds, full-height lift 2000 pounds and maximum dumping clearance, 102 inches.

Single-lever control on the 720 Loader for Twenty-Ten and Thirty-Ten Wheel Tractors speeds operation. The 720 Loader has 6650 pounds pryout pressure, 3500 pounds full-height lift effort, and clears 99-1/2 inches for dumping. Buckets are 5/8 and 7/8 yard.

30-degree rollback gives the 740 Loader for the Forty-Ten Wheel Tractor 6650 pounds of pry-out. Bucket capacity is 7/8 yard and lift effort, 3500 pounds at full height. Dump clearance is 99-1/2 inches. The loader frame is designed to accommodate rear-mounted backhoes.

Increase trenching versatility

with a John Deere 50 or 51 Backhoe

Team the new power, handling ease and mobility of John Deere Tractors with the field-proved performance of either the 50 or 51 Backhoe! You'll take advantage of every benefit of John Deere's new advances in engine power and hydraulics, plus the greater trenching versatility these units provide. Ease of operation and quick adaptability to working conditions are your assurances of low-cost trenching for soil pipe, foundations and cable laying.

2-Lever Control. Efficient 2-lever control of boom, dipper stick, and bucket, a widely preferred feature on John Deere Backhoes during the past two years, is yours again with any backhoe combination in the line. Eliminates excess hand motion throughout a long working day; helps operator do fast, precision work.

5-Position Digging. The John Deere 51 Backhoe digs flush right or left against walls, fences or buildings. The rotary boom cylinder centers or slides to any of four off-center positions along the mounting, moved by the unit's own hydraulic power. One man with a wrench easily makes the switch in minutes right on the job.

Take your pick from 5 all-job crawler bulldozers

Need a blade for heavy pioneering, road building, or precision finish grading? John Deere has it! Five outside- or inside-mounted dozers, sized right and power matched for your needs, are included in the new line. All-hydraulic models with power tilt, angle, and cut are now operated by new single T-bar control. Operator moves control to the position he wants and the blade repeats the motion! Just one of many new ideas throughout the whole line!

For clean work at low cost, select the John Deere Ten-Ten Crawler with 610 inside-mounted Dozer. Available with 72-inch or 90-inch blade with three-piece cutting edges. Angles 18 and 25 degrees right or left, cuts to 12 inches below track level, and lifts as high as 40 inches.

Power plus flexibility is yours with the John Deere Ten-Ten Crawler and all-hydraulic 612 Dozer. Change tilt, angle or cut on the go with one control! Inside mounted, with 80-inch blade.

For big work savings, the 624 outside-mounted Dozer mounts on either the Ten-Ten or Twenty-Ten Crawler. Blade is 90 inches wide, 23 inches high with three piece cutting edge. Cuts as deep as 12 inches below track level, and is easily set to angle 25 degrees right or left. Lift is 48 inches.

Pair the extra power of the Twenty-Ten Crawler with new inside-mounted 620 or 622 Dozer. Choose from 72-, 80- or 90-inch blades with hydraulic lift or full hydraulic operation.

Dependable John Deere diesel power, teamed with a versatile elevating scraper, provides a widely preferred earthmoving combination for road and street work, land forming, and stripping overburden.

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Parts and service for any John Deere Tractor are always available from your nearby John Deere dealer. He and his service crew know how to service and maintain construction equipment with minimum downtime expense. Find out how this man can help you now. Check with the classified telephone directory or write John Deere, 3300 River Drive, Moline, Illinois.

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All tractors and equipment can be purchased on terms of the John Deere Credit Plan. Arrangements are made in strict confidence by your dealer. Terms are tailored to individual requirements. Protective life insurance and property insurance are also available at low cost.

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Throughout the United States, three to five-year leasing arrangements can be made through your John Deere dealer. The plan is specifically designed to enable contractors and others to obtain profitable use of the most modern, efficient equipment, without affecting needed working capital.

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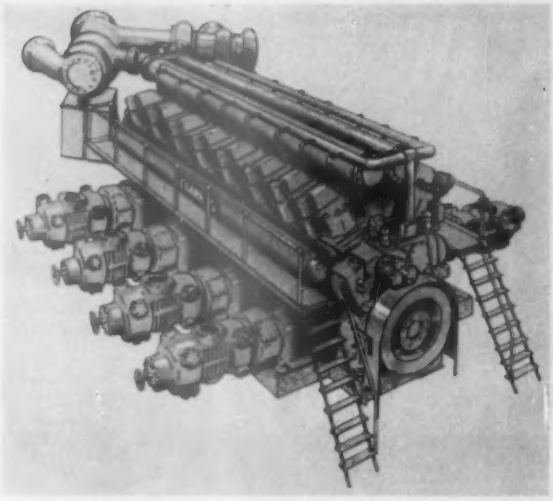
▶ ▶ ▶ New Equipment Section

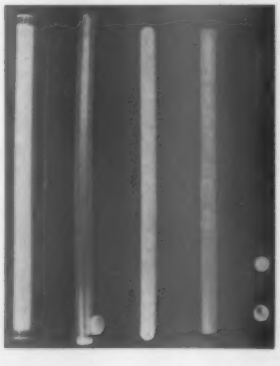
This week's SHOWCASE features . . .



New gas-engine compressor

. . . developing 5,500 b.hp. is claimed to be the world's largest for pipeline gas transmission. Compressor cylinders can be on one or both sides of the crankcase.

The Model TCV is a turbocharged two-cycle machine built in 12 and 16 power-cylinder models rated, respectively, at 4,000 and 5,500 b.hp. The Model TCV-16 can be fitted with as many as eight large cylinders to handle all types of pipeline and process requirements, including multiservice applications where several gas streams are compressed by one machine. Source: **Clark Bros. Co., Olean, N. Y.**



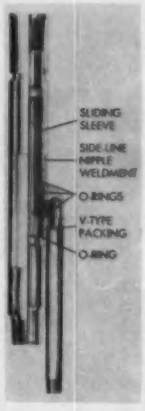
Chemical product

. . . eases swabbing of wells, claims the maker of these Swabstix flow inducers. The product is said to make a simple, easy, and safe method of swabbing. Application requires only one man. He merely drops the required number of units down the tubing.

Each unit consists of a water-soluble, oil-insoluble plastic cylinder filled with powdered chemical that is highly reactive with water or brine. The oil-insoluble jacket lets the unit fall through the oil with no effect on the water-soluble covering. When the jacket contacts water or brine, penetration takes only ½ to 1 hour. The unit then generates enough gas to displace about 500 ft. of fluid in 2-in. tubing, the maker says. Source: **Tretolite Co. Div. of Petrolite Corp., 369 Marshall Ave., St. Louis 19, Mo.**

New crossover

. . . is available for use in single-string dual-producing wells that have a wide differential pressure between the two zones. The Type A tool is designed to prevent the zone feeding problems sometimes encountered with conventional crossover equipment while chokes are being changed.



The tool opens fully to permit the necessary wire-line operations to be performed on the lower zone. One advantage cited for the tool is that it can eliminate the need and cost of having a pump truck on location to equalize pressure across the two zones when you remove chokes. Source: **Otis Engineering Corp., Box 35206, Dallas 35, Tex.**

●

Tubing head assembly

. . . for slim-hole and tubingless completions is rated at 4,000-psi. w.p. and consists of three parts, a tubing hanger, wing-nut union, and the tubing head with two outlets for 1½ and 2-in. line pipe. Constructed of cadmium-plated steel to resist corrosion, the hanger is secured to the tubing head by a hammer type of wing-nut union and sealed off with an O-ring. Source: **Macco Oil Tool Co., Inc., Box 7288, Houston 8, Tex.**

Want more facts about equipment or copies of product literature described in this issue?

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Product name, Model no., literature title or number: .....

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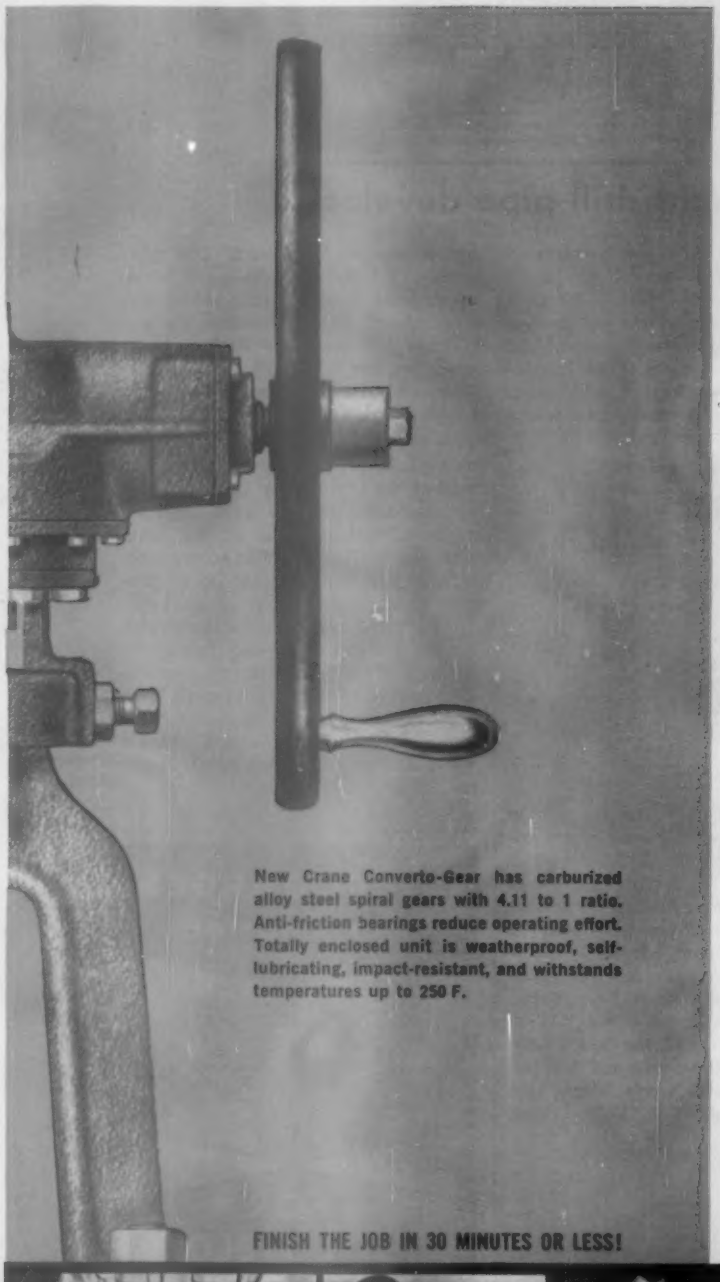

New Crane Converto-Gear has carburized alloy steel spiral gears with 4.11 to 1 ratio. Anti-friction bearings reduce operating effort. Totally enclosed unit is weatherproof, self-lubricating, impact-resistant, and withstands temperatures up to 250 F.

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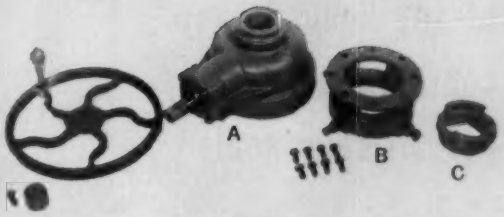

Only three parts needed to convert your OS & Y valve to gear operation: (a) Crane Converto-Gear Operator, (b) adapter for mounting operator on valve, (c) yoke sleeve adapter. Handwheel and mounting bolts furnished with conversion kit.

Now you can convert to rapid, easy gear operation on many of your Crane iron and steel gate valves without removing them from the line! Changeover is simple and fast with Crane's new Converto-Gear Operator.

Your Crane Distributor can give you complete information on this brand-new idea in gear operators for gate valves. The Converto-Gear is standard and universal, readily mounted on Crane iron and steel gate valves in sizes from 6-inch to 36-inch, in outside screw and yoke or non-rising stem patterns.

And new orders for gear operated valves can be filled with unprecedented speed because the Converto-Gear can be supplied on valves right from stock. No special yoke castings or brackets are needed . . . just the basic gear operator and a simple two-piece adapter.

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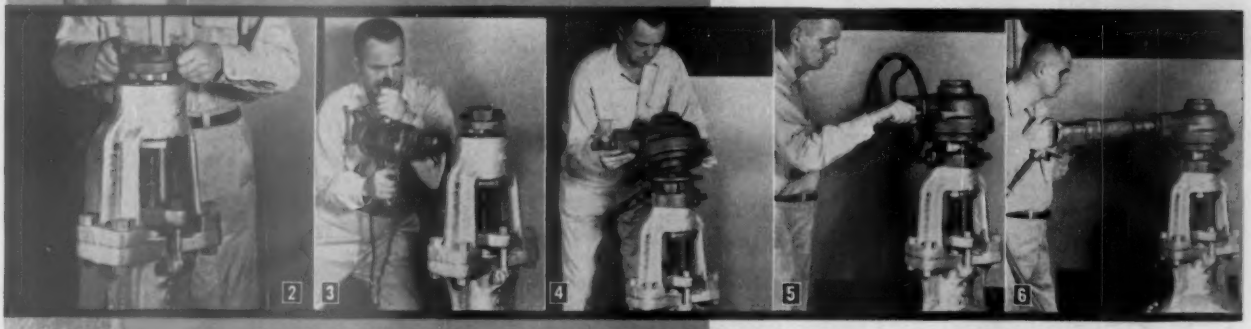

To convert your OS & Y valve, (1) remove the handwheel, (2) mount the yoke sleeve adapter, (3) countersink 4 holes for the Converto-Gear adapter, (4) bolt the adapter in place and attach your Crane Converto-Gear Operator, (5) and you're ready for smooth, manual operation, (6) or fast operation with an air or electric power operator.

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From table oils to toxic chemicals, the FRI "dripless dripstick" can accurately measure the contents of any container. Throughout the petroleum and chemical industry, wherever liquid levels must be determined, this easy-to-read indicator can do the job faster, safer, and with absolutely no contact of the indicator rod with the liquid to be measured. *Fully Tested in Use*

How does it work? A doughnut shaped magnetized float (A) surrounds a guide tube (B) and rides the level of the liquid. A calibrated rod with a magnetic tip (C) is pulled out until magnets (A) and (C) engage. Then, the liquid level is read at point (D) outside the container. Request specifications and prices on your letterhead. PATENTED

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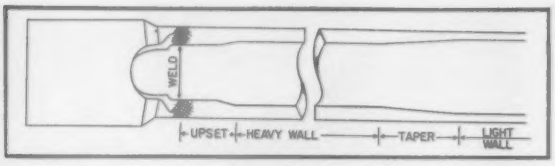
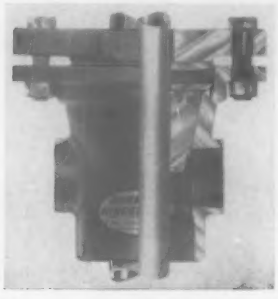


Dual-weight drill pipe developed

... which gives a combination of strength and light weight not previously available and which offers a way to reduce the weight per foot of drill strings, the maker claims. The pipe has from 4 to 6 ft. of heavier wall thickness at the box end which gradually and uniformally tapers to a lighter weight body wall. This provides an integral combination of heavy upper end blended into a lighter-weight body. External dimensions conform to API standards. Both ends are upset for use with API weld-on tool joints. Source: **Pittsburgh Steel Co., Grant Bldg., Pittsburgh 30, Pa.**



Tubing head

... for water floods and for use in areas where lower pressures are encountered, called the Type WS, uses slip suspension to support 5,000 ft. of 2 or 2½-in. upset tubing, the maker announces. The tubing head may be used with a stripper adapter for servicing by removing the top gland and bolting the adapter to the body flange. Available with either a 4½ or 5½-in. female bottom thread, the tubing head is rated at 1,000-psi. test and 500 psi. w.p. Source: **W. C. Norris, Mfgr., Div. of Dover Corp., Box 1739, Tulsa, Okla.**

Check valve

... fits between flanges and, the maker claims, is, on the average, 90% smaller than other check valves of similar pipe size. The Duo-Chek valve uses a resilient type of seal to withstand pressures. Sealing material is molded into a groove in the plate, making an O-ring type of seal. Pressure deforms the seal until metal-to-metal contact is made by the plate with the body seat. This completely encloses the sealing material to prevent pinching off under pressure.

The valve comes in sizes through 36 in. for ASA pressure ratings of Series 150 through 2500 with raised-face or ring-joint facings in steel, Type 316 Stainless steel, aluminum, and aluminum bronze. Source: **Mission Valve & Pump Co., Box 4209, Houston, Tex.**

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Latest tool for drilling

. . . is this combination stabilizer and string reamer with replaceable blades which, the maker claims, provides, compared with older tools, more weight on the bit at faster speed of rotation, straighter holes when spaced at intervals above the bit, and controlled deviation when used as a fulcrum tool directly above the bit.

So they will be easy to remove, the blades are recessed to prevent the weld metal from projecting beyond the periphery of the outside diameter of the body. The maker says that if washover operations become necessary, the blades can be easily cut off with an ordinary burning shoe because there is no hard weld metal to retard the penetration rate. The tool comes with straight or spiral blades. Source: **Hunt Tool Co., Box 1436, Houston 1, Tex.**

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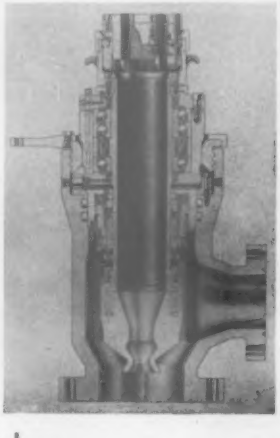

Packer

. . . usable with any equipment for blowout control. The Type LS rotating kelly packer is self-contained within its own housing and consists of a central ball-bearing-mounted sleeve which is provided at its upper end with a driver to engage the kelly drive bushing and at its lower end with a steel-reinforced rubber stripping packer which seals around and rotates with the kelly. To install the packer, just lower it through the rotary table into the housing and lock it in place. Source: **Hydril Co., 714 W. Olympic Blvd., Los Angeles 15, Calif.**

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In these days of deeper wells and faster line speeds, it pays to equip your rigs with Yellow Strand "POWERSTEEL" rotary drilling lines. Here's a built-in ruggedness to combat the shock, strain and wear of today's tough drilling . . . giving you maximum ton-mile service. "POWERSTEEL" rotary lines are made from wire having the highest tensile strength and wear resistance of any Broderick & Bascom wire rope. You gain the safety and assurance of high reserve strength, too.

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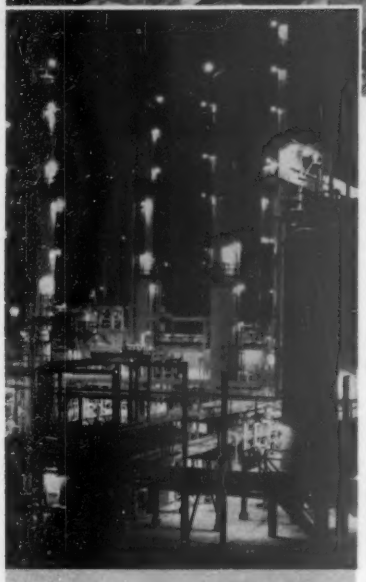

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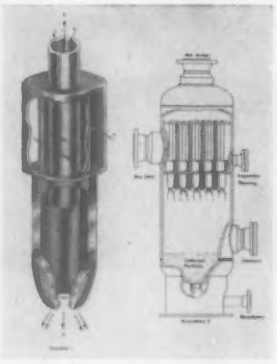

Dry scrubbers

. . . are offered to remove dust and liquid from gas lines. According to the maker, the dry scrubbers use multiple cyclones to achieve high efficiency in the removal of dirt and liquid.

They come in sizes and working pressures to fit any scrubber requirement. The cyclone elements are made of an alloy that is resistant to abrasion, corrosion, and shock, the maker says. Source: **Peerless Mfg. Co., Box 13165, Dallas, Tex.**

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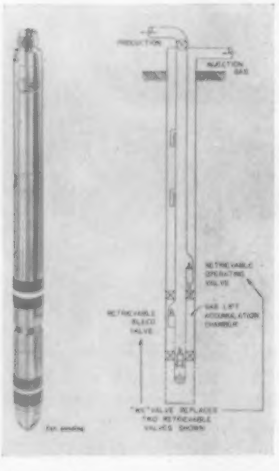

Valve does two jobs

. . . at the same time as it rapidly vents accumulation chambers in gas-lift wells through a ½-in. port and acts as a regular gas-lift valving through its 11/16-in. main port, according to the manufacturer of this Type WE wireless gas-lift valve. The valve is expected to prove especially useful in high gas-oil ratio wells.

To convert accumulation-chamber installations to the new valve, merely retrieve the lower gas-lift valve and replace it with the new valve. The existing vent valve does not need to be removed. Source: **Harold Brown Co., Box 25047, Houston 5, Tex.**

Cemented tubing

. . . milled fast with a new mill recently developed, called the **Piranha.** It mills at high penetration rates even when the tubing is alongside the casing wall, the maker claims. Three cutters in the inside diameter mill up the core of metal left by the regular cutters.

Protective pads are provided in the top sub. The outside diameter of the cutter blades are treated so they will cut on bottom only. The maker claims the tool will not damage or cut the casing wall. Source: **A-Z International Tool Co., 5619 Fannin, Houston.**

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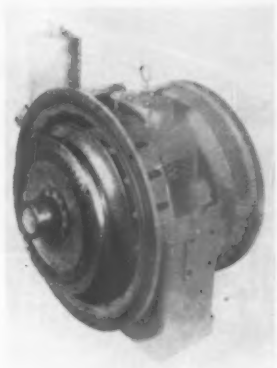
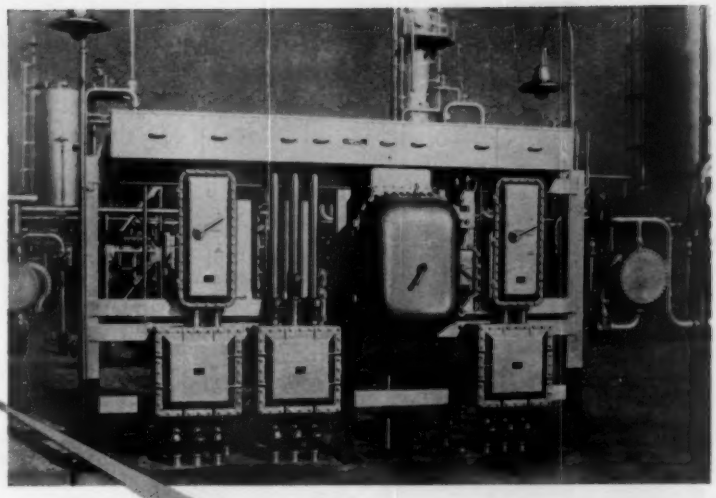


Single-stage torque converter

. . . now comes in sizes to meet any application requirement in the 100 to 300-hp. range. The impeller, impeller cover, and turbine are precision aluminum castings.

The converter comes in three series, 1100, 1300, and 1500. Each series has five interchangeable impellers. Changing the impeller has the effect of changing the torque absorption capacity. This feature gives a two-to-one horsepower spread for each series of converter. Source: **Twin Disc Clutch Co., Hydraulic Div., Rockford, Ill.**



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New Literature

Nondestructive testing equipment

. . . brochure (12 pages) contains engineering facts and specifications for many X-ray test units for radiography and fluorescopy. Illustrated with pictures and drawings, the publication gives data on auxiliary equipment such as tube stands, including details on hydraulic tube carts, chain-hoist-operated jib cranes, pedestal and telescopic overhead mountings, and mobile chassis units. Source: **Philips Electronic Instruments, 750 S. Fulton Ave., Mount Vernon, N. Y.**

Boiler-water-level controls

. . . for pressures from 30 to 1,668 lb. w.s.p. are explained in new Catalog Section 3, yours free upon request. Included are engineering data, cutaway views, installation sketches, and dimensions. The literature describes and illustrates safety features, infinite-life magnetic principle, flexible switching action, and model range. Source: **Magnetrol, Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.**

Compressed-air-leak

. . . cost chart shows comparison costs. Hanger Card F-255-A presents area of leak by diameter in fractions of an inch, air loss by cubic feet per month at 75 psi., and dollar loss by cost of waste per month at $0.12 per 1 M.c.f. Source: **Punch-Lok Co., 321 N. Justine St., Chicago 3, Ill.**

Chemical tubing cutter

. . . which cuts tubing by pushing a button after lowering the cutter to the desired depth, is described in a new four-page publication. Bulletin 801 offers illustrations, specifications, performance data, and operating advantages. Source: **McCullough Tool Co., 5820 S. Alameda St., Los Angeles 58, Calif.**

Instruments

. . . and controls are detailed in Composite Catalog 4-60, just made available. The 16-page publication describes and illustrates continuous density and level controls, level switches, combustion controls, custom control

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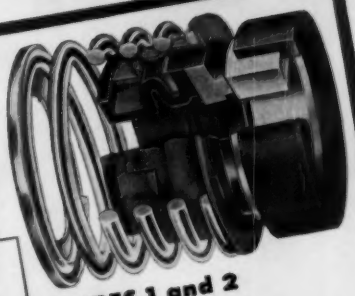

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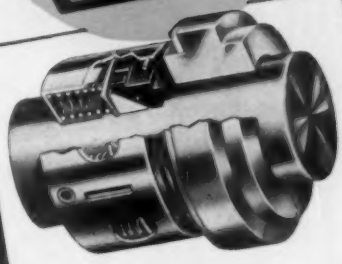


TYPE 9
EXPENSIVE CHEMICALS
CORROSIVES
FLAMMABLE LIQUIDS
SOLVENTS
TOXICS

MECHANICAL SEALS

There is no better way to cut liquid handling costs than with "John Crane" Seals. They are specially engineered for the Chemical Industry to provide these important operational savings:

1. **Eliminating loss of expensive and corrosive fluids.**
2. **Positive sealing of toxics, thus minimizing need for costly exhaust equipment.**
3. **Substantially reduced maintenance and the man-hours involved.**
4. **Reduction of "shutdown periods" due to materially increased service-life expectancy over and above your present methods.**

Ranging from the Types 1 and 2 (for services where synthetic rubber is suitable) to the Type 9 (with sealing members made of DuPont Teflon to handle any industrial chemical or corrosive) . . . there is a "John Crane" Seal that can be adapted to your individual conditions.

remember: **Your toughest problem can be "John Crane's" next success story.**

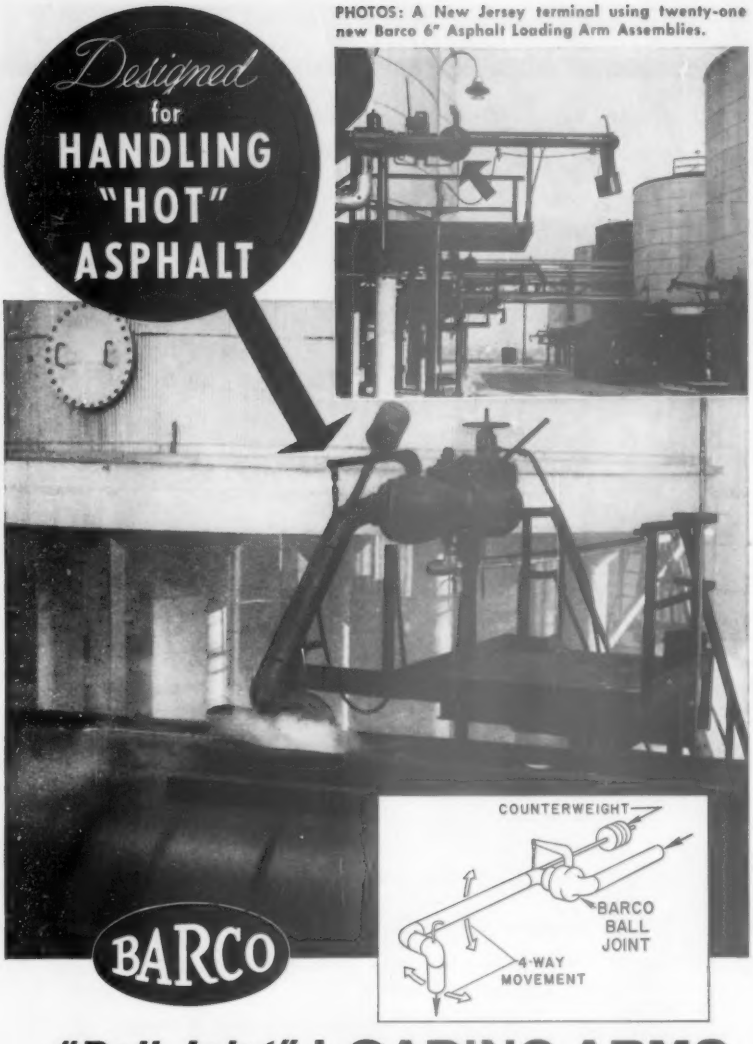
Don't wait, call us now. Get our seal catalog . . . . .

Crane Packing Co., 6419 Oakton St., Morton Grove, Ill., (Chicago Suburb). *In Canada: Crane Packing Co., Ltd., Hamilton, Ont.*

In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

John Crane CRANE PACKING COMPANY

PHOTOS: A New Jersey terminal using twenty-one new Barco 6" Asphalt Loading Arm Assemblies.



"Ball Joint" LOADING ARMS

CHECK THESE POINTS! Here's why more and more refineries and chemical processing plants now use Barco Flexible Ball Joint Loading Arms for handling ASPHALT and other high melting point fluids:

- ☑ **MADE FOR HIGH TEMPERATURES!** 400°, 500°, or 600°F present no problems.
- ☑ **ECONOMY!** Simple construction; fewest number of parts. One Barco Ball Joint, combining 360° swivel motion with 30° angular movement, does the work of more complicated "double" ball bearing swivel joints.
- ☑ **NO LUBRICATION!** No ball bearings in Barco flexible joint to require frequent greasing. No trouble with gumming up of ball races due to "oozing."
- ☑ **FIRE SAFE!** Barco Ball Joints have passed rigid Fire Tests for refinery and chemical plant service.
- ☑ **STEAM JACKETED!** Available with jacketed construction, or easy to apply steam tracing and insulation.
- ☑ **NEW COUNTERWEIGHTED STYLES!** Standard and custom designed loading arm assemblies can be furnished by Barco, complete. or joints only for use with standard pipe.

Inquiries are invited; ask for catalog.

BARCO MANUFACTURING CO.
539K Hough Street, Barrington, Illinois
The Only Truly Complete
Line of Flexible Ball, Swivel, Swing and Rotary Joints
In Canada: The Holden Co., Ltd., Montreal

SEND FOR CATALOG 2158

panels, and miscellaneous products. Source: **Instruments, Inc., Box 556, Tulsa, Okla.**

One-piece pipe insulation

. . . called Mono-Kover, for service from below zero to 350° F., is described in new technical Bulletin J-660 just published. One table in the four-page literature piece suggests recommended thicknesses for various pipe sizes and operating temperatures based upon the heat loss desired. Recommended thicknesses for cold piping and dual-temperature service are also given. Source: **Baldwin-Ehret-Hill, Inc., 500 Breunig Ave., Trenton 2, N. J.**

Screw conveyor drives

. . . which are available for applications ranging from ½ to 30 hp. (output torque to 21,400 in.-lb.), in four ratios, designed to bolt to conventional trough ends, are described in Bulletin 7106. Design features and accessories are covered, including choice of trough end seals; removable drive shafts; optional trough ends; and optional motor mounts which permit mounting motors directly on the reducers. Source: **Falk Corp., Dept. 255, P. O. Box 492, Milwaukee 1.**

Seals for pressures

. . . to 125 psi. are detailed in obtainable Bulletin AD-150 (8 pages), which contains engineering and application data. Illustrated with drawings, the literature outlines temperature, pressure, shaft speed, and other critical operating information necessary when selecting or using mechanical-sealing devices. Two tables are included: one listing sizes of Mechanipak seals, the other detailing construction of various seals. Source: **Garlock, Inc., Palmyra, N. Y.**

Building-maintenance

. . . manual lists characteristics of 12 different floor surfaces, details precautions to be observed with each, and lists types of products recommended for their upkeep. The 28-page manual also provides step-by-step procedures for cleaning and finishing floors and for day-to-day maintenance. Other sections deal with general cleaning, safety, stain removal, polishing, solutions to common maintenance problems, and care of equipment. Source: **Service Products Div., Johnson's Wax, Racine, Wis.**

▶▶▶ Equipment Men Notes

National Supply Co. authorizes

. . . the appointment of Eastman Oil Well Survey Co. as its exclusive prime distributor of Gammaloy drill collars for export. Eastman, specialist in directional drilling and related instrumentation, will promote the sales and use of the collars through its worldwide service organization.

Walworth forms new division

. . . with sales and service headquarters in Houston. The Lubricated Plug Valve Division is headed by Clyde W. Cook, new vice president in charge of lubricated plug-valve operations. Assistant vice president of the operation,

C. W. Cook

R. F. Klein

R. Fred Klein, is located at Walworth's New York headquarters.

The division has manufacturing facilities available in the company's two-year-old plant in East St. Louis. A technical sales force, which will work closely with Walworth distributors, is augmented by a service fleet which employs aircraft and vehicles equipped for quick valve service. The new service provides mobile educational facilities for on-site training of customer personnel.

McCormick stockholders 'OK'

. . . the sale of all assets of McCormick Steel Co. to Ducommun Metals & Supply Co., Los Angeles, for about $3,750,000 in Ducommun stock, notes, and cash. The vote was 114,799 shares for the sale and none against out of 121,200 shares outstanding. The sale is contingent on receipt of a favorable income-tax ruling and will be consumated as soon as the ruling is received. The business will continue under the name of McCormick Steel Co. with existing management.

Austin Rankin Corp. is formed

. . . in Houston by H. Lee Trentham to offer design, engineering, and construction services to the process industries. Activities will be principally in Texas, Louisiana, Oklahoma, Arkansas, and New Mexico.

Formerly vice president of engineering for Delta Engineering Corp., Trentham is a veteran of 17 years in the petroleum, petrochemical, and chemical industries. He has also held positions with Walter Kidde, Fish Engineering, Tennessee Eastern, and Celanese.

Arnold M. Hegwer, E. D. Turner, and Byrne A. Padon will serve on the firm's executive staff with Trentham, as executive vice president, vice president, and secretary-treasurer, respectively.

INTERNATIONAL GUESTS at the recent meeting of the Los Angeles Chapter of Nomads are, front row, from left: Stan Nelson, D & E, Iraq; E. E. Lay, Qatar Petroleum Co., Qatar; George A. Waters, also of Qatar Petroleum, Arabia; and Paul Hughes, Ralph M. Parsons Co., Ethiopia. In the back row are Everett Forte, Esso Standard, Libya; J. W. Killingsworth, Iraq Petroleum Co., Kirkuk; Mel Cooper, Volco, Inc., Colombia; and R. B. Hearne, Cal Tex, Sumatra.

Oil Base, Inc. reduces costs

. . . of high-grade barite as a result of eliminating engineering services and by establishing nearby stocking points. Presently the offer is limited to Louisiana's Zone 1. The weight material is marketed under the tradename O B Hevywate.

Stock points for both bulk and sacked barite have been set up at Lake Charles, Crowley, and Lafayette, La. A warehouse and stock point have also been established at Houston to serve operators within a radius of 40 miles of that city.

Grove Valve & Regulator names

. . . Dale N. Johnson as sales and service representative in Houston, and Claude W. Brown as sales and technical service representative for Oklahoma and Kansas.

Johnson has been with Franklin Supply Co. for the past 7 years, serving in various technical sales and service capacities throughout the southwest. Brown, now headquartered in Oklahoma City, has been associated with the gas and petroleum-equipment industry for the last 22 years.

Robert J. Barrett, Jr. appointed

. . . to the new position of director of administration of Thompson-Ramo-Wooldridge Products Co., reports Dr. Joseph F. Manildi, general manager of the industrial control computer firm.

Barrett will be responsible for all matters of organization, finance, and policy of the company, which is a division of Thompson Ramo Wooldridge Inc. A member of the senior staff of TRW Inc., he was formerly controller of Thompson-Ramo-Wooldridge Products Co.

W. H. Attlesey is appointed

. . . export sales representative for Houston Oil Field Material Co., Inc. His 13-year oil-industry experience was gained through associations with Superior Oil Co., Eastman Oilwell Survey Co., E. B. Hall & Co., Victory Oil Co., and Harvey-Williams Drilling Co. The latter assignment was in Brazil where Attlesey was a technical advisor to Petrobras, directing programs of production evaluation and exploratory drilling.

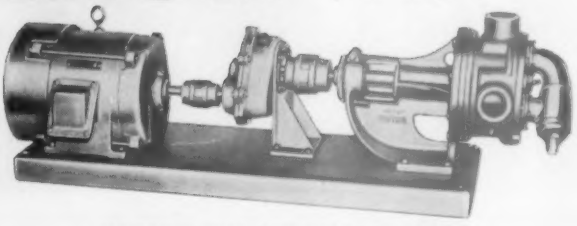
Baker Oil Tools, Inc. transfers

. . . its research headquarters from Los Angeles to Houston, where the company plans an expansion in research and testing facilities.

H. H. Fisher has been named chief research engineer succeeding J. R. Baker, who has been reassigned as

For Fast Priming and Smooth Flow of

THICK OR THIN LIQUIDS



INSIST ON VIKING PUMPS

By insisting upon and using Viking POSITIVE DISPLACEMENT rotary pumps, you can eliminate slow priming, vapor locks, spasmodic delivery, high speed noises and partial emptying of tanks. Units feature the new helical gear drive and are equipped with heavy-duty pumps with delivery ranging from 17 to 164 gallons per minute.

Five interchangeable speed reducers permit easy change of pump speeds for handling thin or thick liquids. Maximum pressure is 200 PSI on lubricating liquids, 100 PSI on non-lubricating liquids.

For complete information send for catalog section CT, pages 27-28.

VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, It's "ROTO-KING" Pumps

Offices and Distributors in Principal Cities • See Your Classified Telephone Directory

PAT. APPLIED FOR

"BEVEL-LAND" GRINDER
. . . smooths pipe cuts and places the lands on bevels in a matter of seconds.

PATENT NO. 2,869,293

H & M STANDARD MACHINES

Save Manhours . . .
Increase Profits

H & M Standard Machines give accurate, dependable pipe cutting and beveling results cut after cut . . . in the field or in the shop. The seven models of H & M Machines are designed to handle all sizes of pipe from 1½" - 36". H & M's are lightweight, easy to handle . . . and are built to withstand the toughest operating conditions. **WRITE FOR A CATALOG ON THE COMPLETE H & M LINE, TODAY!**

H&M PIPE BEVELING MACHINE COMPANY

311 E. Third St. DI 3-0241

TULSA, OKLAHOMA

TM Reg

manager of the company's new Mexican subsidiary, Baker - Herramientas Petroleras, S.A. Fisher previously was chief product engineer in Houston.

J. D. Keithahn, former research engineer in Los Angeles, has been named chief product engineer in Houston. J. F. Muse continues as chief product engineer in Los Angeles.

Grant Oil Tool Co. establishes

. . . its 18th branch office—this one in Kilgore, Tex.—to provide the area with specialized down-hole tools and MacClatchie slush pump valves and seats. The new branch is under the

George Carter

Drew Johnson

supervision of George Carter, recently appointed division manager. Drew Johnson, former manager at Casper, Wyo., has been placed in charge of the Kilgore office.

General Electric names pair

. . . to the marketing section of the company's medium steam turbine, generator, and gear department, announces Hughes W. Ogilvie, manager of marketing.

Charles B. Seelig, former manager of marketing for the small steam turbine department at Fitchburg, Mass., was named manager of foreign industrial and utility sales. Kenneth A. Drewry was named manager of industrial sales. He had been manager of export sales, land equipment for MSTG&G.

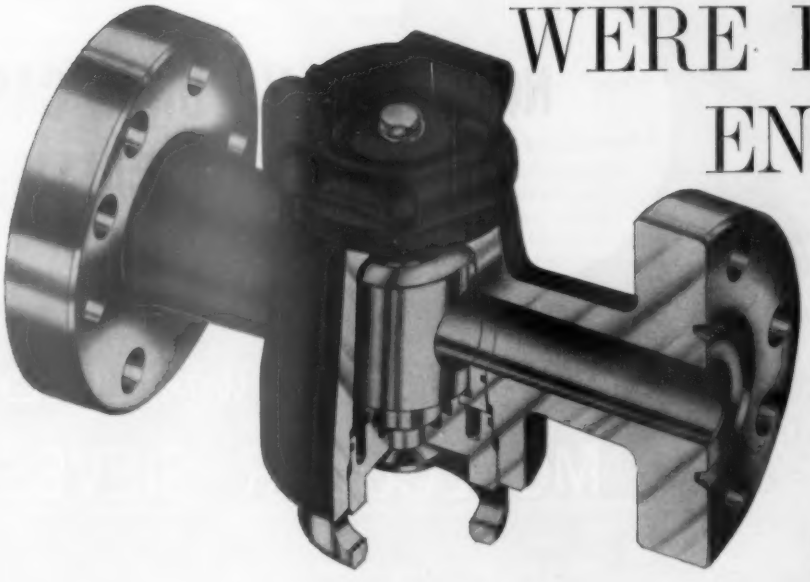
At the sale time, Edmund K. Nock was appointed marketing manager of GE's small steam turbine department. Previously he was manager of domestic industrial sales of the medium steam turbine, generator, and gear department at Lynn, Mass.

Goulds Pumps, Inc. establishes

. . . a separate corporation—Goulds Pumps International, Inc.—to handle all company export sales, according to E. E. Backlund, vice president and general sales manager of the Seneca Falls, N. Y. firm. Offices of the new company are at 260 Madison Avenue, New York 16.

The arrangement covers all products made by the manufacturer and includes both its complete line of jet

WHEN NO OTHERS WERE RUGGED ENOUGH...



we designed our own!

LO-TORQ PLUG VALVE

SIZE AND SERVICE RANGE

Valve Size	End Connection	Working Press. (psi)	Test Press. (psi)
1"	2" Threaded (male)	15,000	20,000
1½"	Threaded (female)	15,000	20,000
2"	Threaded (female)	10,000	15,000
2"	Threaded EUE Tubing (female)	5,000	10,000
2"	Series 900 A.P.I. Ring Joint Flange	3,000	6,000
2"	Series 1500 A.P.I. Ring Joint Flange	5,000	10,000
3"	Threaded (female)	3,000	6,000
3"	Threaded (female)	5,000	10,000
3"	Series 900 A.P.I. Ring Joint Flange	3,000	6,000
3"	Series 1500 A.P.I. Ring Joint Flange	5,000	10,000

In addition to these models, the Lo-Torq Plug Valve design is available in several unitized Christmas Tree applications.

The high pressures and abrasive fluids we work with daily in our fracturing, cementing and chemical services call for only the toughest kind of plug valve. We searched everywhere and when none stood the test nor met our exacting specifications, we designed and manufactured our own. Today, our Lo-Torq Plug Valve is the toughest, most dependable of its kind . . . so well-accepted that we have had to increase the size and service ranges to meet your increasing demand. Now, the Lo-Torq Plug Valve is also available with flanged ends, as illustrated above . . . in 2" and 3" full-opening sizes . . . plus the regular line of 1" to 3" valves with threaded connections. *Working pressures* range from 3,000 psi to 15,000 psi; test pressures from 6,000 psi to 20,000 psi.

CHECK THESE ADVANCED FEATURES:

Economical Low initial cost . . . very little maintenance.

Easy to use Balanced cylindrical plug requires less effort to operate. One quarter turn from full open position completely closes valve.

Easy to maintain Does not require removal from the line for repair or replacement of internal parts . . . no matching parts requiring return to factory.

Rugged For heavy duty operation . . . and is light in weight for mobile field application.

FOR MORE INFORMATION . . . SEE YOUR NEARBY HALLIBURTON MAN

275 Service Centers . . .
just minutes away from your well

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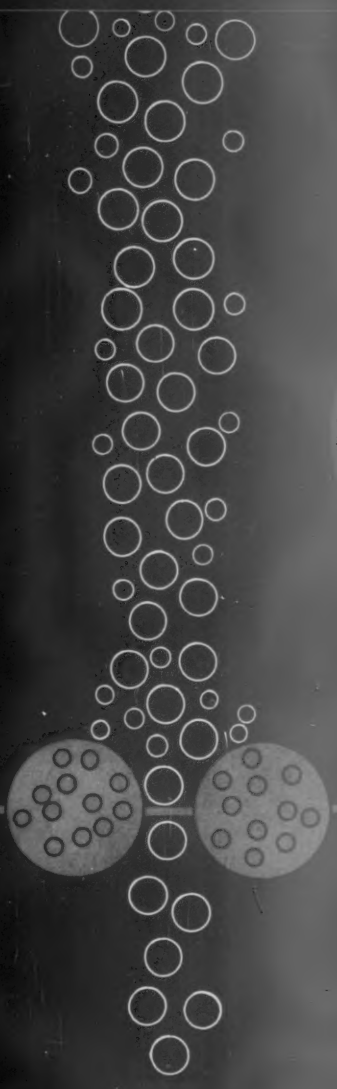


NOW—DRY NATURAL GAS MORE ECONOMICALLY

...WHEN YOU ADSORB WITH LINDE MOLECULAR SIEVES

This is only one of many applications which utilize the high capacity and selectivity of LINDE Molecular Sieves. In fact, Molecular Sieves not only outperform other adsorbents, but do other adsorption jobs never before accomplished. Whether in new installations or as replacement adsorbent in existing units, Molecular Sieves can help you minimize both investment and operating costs. More specifically, here's how they are used. . . .

A major petrochemical company has reduced the CO_2 content of its ethylene from 3000 PPM to less than 1PPM. This high purity is achieved in a single-stage process, automatic and non-corrosive, which has proved to be more economical than the alternative four-stage process. Other petrochemical uses include drying of cracked gases, ethylene, hydrogen, liquid propylene, solvents and many other gases and liquids. **Natural gas producers** use Molecular Sieves for drying and sweetening of natural gas, for sweetening of liquid propane and butane, and for drying of adsorber oil. **Petroleum refiners** use them to gain efficiency in drying reformer hydrogen, liquid butane LPG and transformer oil, and for removal of impurities such as CO_2 and mercaptans. **Refrigeration manufacturers** use Molecular Sieves as a desiccant in super-drying refrigerants to eliminate freeze-up and corrosion.

For these and many other adsorbent applications, you can rely on patented LINDE Molecular Sieves to perform more effectively. They are the top quality material of their kind available today, always uniform, with high capacity, high strength, and high bulk density. They are available in regular and special grades to meet your specifications.

LINDE technical know-how—gained from years of laboratory and field work with adsorption problems—can help make Molecular Sieves work profitably for you. For further information, write: Dept. O-092 Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. **In Canada:** Linde Company, Division of Union Carbide Canada Limited, Toronto 7, Canada.

SOME AREAS WHERE MOLECULAR SIEVES IMPROVE ADSORPTION

- Purification of ethylene
- Drying gases, liquids, solvents
- Drying, sweetening natural gas
- Sweetening liquid propane, butane
- Drying jet fuels
- Octane improvement
- As refrigerant desiccant
- Controlled atmosphere purification

LINDE COMPANY

"Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation

UNION CARBIDE

and submersible-type domestic water systems and its range of centrifugal pumps.

Donald J. Wallace takes over

. . . as district sales manager of Coffing Hoist Division of Duff-Norton Co., announces T. W. Krueger, vice president and general sales manager of Duff-Norton.

Now locating in Chicago, Wallace had been in New York, serving as Coffing's district sales manager. He formerly held the same position in Cleveland. In his new post, he will direct sales activities for hoists in northern Illinois, northern Indiana, Wisconsin, Michigan, Minnesota, North Dakota, and South Dakota.

Oil Recovery Corp. files

. . . a registration statement with the Securities and Exchange Commission covering a proposed public offering of $1,600,000 convertible debentures due September 1, 1970. Lehman Brothers and Allen & Co. will manage the underwriting.

Of the proceeds, about $700,000 will be used for development and initial operation, employing the Orco process for secondary oil recovery, of certain properties owned by the company, and of one additional property which it may acquire with existing funds. The remaining proceeds will be added to general funds.

Tex-Tube shifts C. S. Hightower

. . . to the firm's Dallas offices where, as field engineer, he will service cities throughout North Texas. At Tex-Tube, Hightower has specialized in pipeline design and engineering, oil-well tubing, and completion methods. Previously he was with Arkansas Fuel Oil Corp.

Tom P. Walker elected to board

. . . of Burgess-Manning Co., Libertyville, Ill. and Dallas. Walker retired as president of Transcontinental Gas Pipe Line Corp. in 1958. He continues as a member of the Transco board.

John Deere equipment is shown

. . . in Dallas to more than 6,000 company sales personnel, including dealers from throughout the United States and Canada. More than 5,000 of the persons attending the recent 1-day meeting were airlifted to the gathering site.

Because of the large group in attendance, a five-sided screen was hung from the ceiling of the Dallas Memorial Auditorium. Synchronized projectors showed motion pictures on all sides simultaneously. Closed-circuit television was used to project large images of speakers on the screens.

Datronics, Inc. is assigned

. . . to market the Knust kinetic vapor pressure controller throughout North America. Bernard Knust Co., Inc. is licensed to manufacture the new instrument, which is designed to make crude-oil pipelines more efficient carriers of petroleum volatiles such as butane and natural gasoline.

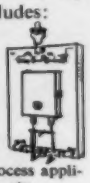
The controller was developed by Shell Pipe Line's technical development laboratories in Houston and is being used at several locations in Shell's pipeline systems. Datronics, Inc. is setting up sub agents throughout the United States, Canada, and Mexico to market the controller.

VISITING THE CUSTOMER is H. L. Durham (right), Square D Co. field engineer, as he demonstrates the new Spin Top explosion-resistant enclosure to personnel of Great Southern Chemical Co. at Corpus Christi, Tex. This touring display is one of a number Square D presently has on the road. Other station wagons are demonstrating distribution equipment and motor control. Reaction has been so favorable that the company plans to keep its fleet of displays in the field, bringing electrical equipment right to the customers' doors.

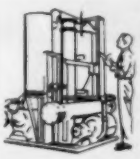
WILLIAM C. DIMAN,
Atmosphere Equipment Specialist, reports . . .

MODERN PROCESSES DEMAND MODERN ATMOSPHERES

Ever since 1927, when C. I. Hayes perfected the first controlled-atmosphere heat treating furnace, we have made a steady effort to further the technology of atmosphere generators and dryers. By recommending proper generators and dryers, we have helped our customers speed production, improve product uniformity and quality and save processing time and trouble. The big Hayes equipment line includes:



MOLECU-DRYER (using LINDE'S Molecular Sieves) — for drying, sweetening, purifying protective atmospheres and for gas and liquid separation and recovery. Exit gas dew points to less than minus 100°F. Many standard sizes available for process applications, instrument air drying, etc.



Linde MOLECULAR SIEVES

NITROGEN GENERATORS (using LINDE'S Molecular Sieves) — produces 99.99% pure inert gas at about 20¢ per 1000 cu. ft. Standard sizes from 1000 CFH to 10,000 CFH

"ENGINEERED ATMOSPHERES" — HAYES offers a broad range of equipment for producing oxidizing, reducing, carbon-potential, and nitrogen-hydrogen atmospheres . . also engineered equipment packages for stand-by (start-ups, emergencies, etc.). Standard sizes are available in all types Exothermic, Endothermic, and forming gas generators — also ammonia dissociators.

Hayes offers more than just equipment. Our Engineering organization and experimental lab. are ready to help make sure you get the right atmosphere equipment for your work.

ASK FOR BULLETINS . . .	Bulletin No.
Molecu-Dryer	5703-A
Nitrogen Generator	5901-NI
Exothermic Generator	256-A
Endothermic Generator	5808-A
Ammonia Dissociator	5810-D
General Bulletin	5810-GC
Forming Gas Generator	256-A

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Established 1905
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It pays to see Hayes for metallurgical guidance, lab facilities, furnaces, atmos. generators, gas/liquid dryers.

CORROSION?

CORBAN

Corban®, the Dowell family of polar-type corrosion inhibitors, is offered in 17 varieties to meet — and combat — well corrosion problems. Corban comes in three forms: "ready-to-use" liquid, concentrated liquid, and sticks. Also more than a dozen formulas — for sweet crude, sour crude or gas condensate wells. Available immediately at 150 points in the oil country through Dowell offices and stations.

Products for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

Nine steps to rig safety

TO SELL SAFETY is not an easy task. Supervisory personnel are placed in the role of salesmen with no samples or anything tangible to display or sell. Even stocks, while representing no immediate and tangible object, are at least represented by bills of sale and certificate.

Safety and successful safety programs can be represented only by clear mental attitudes and physical well-being of personnel involved. One of the greatest problems that a safety program encounters is the individual's inner mental attitude that safety rules and practices are not likely to affect him personally. Only by a complete change of mental attitude of the employe toward his job can safety success be accomplished in many cases.

An extensive and intensive program should be planned. It should be varied and interesting with the purpose of instilling a permanent **safety-mindedness.** Locations, surroundings, and particular sets of instructions change rapidly and too often in the drilling industry for these to be very effective.

Here are the nine steps to safety success:

1. Sell the program to management with a definite understanding of its need so that it then can be sold to the employes. No difficulty is encountered in selling the humane side of safety. No one wants to see his men get hurt. If safety is related to a dollars and cents aspect, the economic implications have a tremendous impact. Look at it this way:

Labor is about 40% of the cost of drilling a well. The average manual rate of $7.54 per $100 of payroll is paid for compensation insurance of all firms engaged in drilling wells. Thus, the compensation insurance cost is 1.9% of total costs for drilling a well. Small? Perhaps, but the average net profit of 300,000 manufacturing companies is 4%. If the accident-prevention program could cut compensation costs in half, the profit picture would be improved by a whopping 24%. This is not so small.

What are the odds of getting hurt on a rig? A 20-year study of injuries conducted by the National Safety Council in conjunction with the federal Government and various contractors shows that out of every eight accidents there is one injury. This makes the odds 8 to 1, with 7 near misses. The principal cause is either an unsafe human act or an unsafe condition. Out of 100 rig accidents, 90 to 96 are caused by unsafe acts. Out of 8 accidents, a man had to commit 300 unsafe acts. The odds, then, are 300 to 8 to 1 before someone gets hurt. Pretty high odds? Don't kid yourself! The injury axe may fall on the first or the fiftieth time an unsafe act is committed and the next injury could be a fatal one. If an effective safety program could cut the unsafe acts committed in half, look how high the odds would go.

2. Know the safety elements of various jobs. The hazards stem from the job and the safety salesman must be well informed to recognize what these are. Everything possible that can be learned about any job should be known so that all hazards can be minimized as much as possible.

3. Require and expect safe workmanship. Safety may not be the end point, but it is certainly a means to an end. The employe should be convinced that the company pays him not just for workmanship—but safe workmanship.

4. Set a good example. Nothing will wreck a safety record faster than a demonstration by a safety man in which he is merely giving lip service to the program. Safety equipment—hard hats, shoes—should be worn on the floor.

5. Be alert. The first violation of a safety rule may not cause a worker to be hurt. The violations should not go unnoticed. Strong action may be necessary when repeated unsafe practices become habits. Correct unsafe practices immediately.

6. Teach safety. The best way to make a good worker out of a new hand is to teach him properly at the start. Safe practices will then become part of his daily work. Continual education of crews will teach respect to each for his job. A good worker is one who knows his job and understands why he does what he does. Interest can be developed by asking the men for suggestions. Often these ideas will have merit.

7. Promote safety by personal contact. Personal contact may well be the safety salesman's most powerful device for getting his people to work safely. The most important of all is

Adapted from a talk given by Dick Kellogg, vice president, Kellogg Drilling Co., Bakersfield, Calif., before the Western Oil & Gas Association safety conference in Bakersfield earlier in the year.

No joint leakage...no creep with AMERICAN IRON Straight Grip Tool Joints!

No worry about joint leakage or creep with our 4 POINT SEAL PROTECTION . . . in fact, the seal actually becomes TIGHTER as the tension load and pump pressure are increased.

AMERICAN IRON Straight Grip tool joints are *three times* as strong as the pipe they connect! You'll like the quick, easy way this hand applied Straight Grip can be removed and installed right at the rig. STRAIGHT GRIP tool joints are ideal for handling high tensile drill pipe.

These are just a few of the reasons why you buy quality when you specify AMERICAN IRON.

AVAILABLE THROUGH YOUR SUPPLY STORE

AMERICAN IRON
Straight Grip
TOOL JOINT

AMERICAN IRON

Another AMF Product
PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC
518 North Indiana Avenue Oklahoma City Oklahoma
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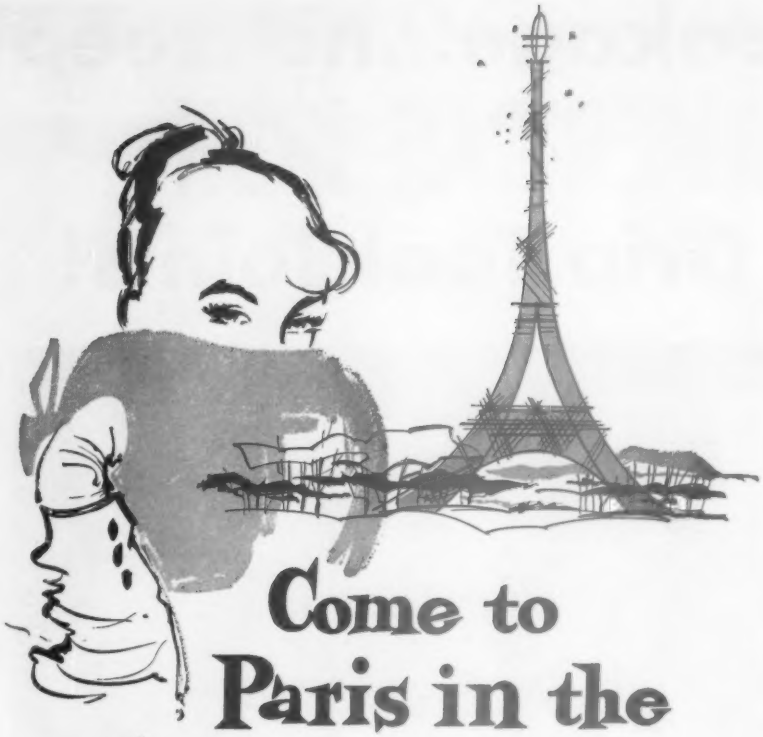

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STEEL FORGINGS, INC.
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individual contact — talking to each person at regular intervals.

8. Use imagination. Safety material is provided by several sources which include the company and trade associations. More enthusiasm can be generated by the safety man if he is encouraged to develop his own safety-promotion ideas.

9. Work with the company's safety program. No safety man can go it entirely alone. Safety committees, inspections, posters, bulletins, suggestion systems, and safety meetings are devices for stimulating the safety program.

Safety is everyone's business.

Active Rigs*

	Rotary	Cable	Total†
Alabama	6	0	6
Alaska	7	0	7
Arizona	1	1	2
Arkansas, South	23	0	23
California, Offshore	6	0	6
Inland	119	1	120
Colo., excl. Four Corners	22	3	25
Four Corners	10	1	11
Florida	2	0	2
Georgia	3	0	3
Idaho	0	0	0
Illinois	49	7	56
Indiana	22	38	60
Iowa	1	0	1
Kansas, western	104	11	115
Kentucky, western	3	39	42
Louisiana, North	101	0	101
South Inland	230	0	230
Offshore	66	0	66
Michigan	53	44	97
Mississippi	61	0	61
Missouri	0	1	1
Nebraska, East	1	0	1
West	17	0	17
Nevada	3	1	4
New Mexico, East	85	25	110
West	41	5	46
North Dakota	15	0	15
Oklahoma, Panhandle	18	15	33
Ohio	7	115	122
Oregon	1	0	1
Pennsylvania, North and Middle	0	57	57
South Dakota	1	1	2
Texas, Offshore	0	0	0
East	60	0	60
Upper Gulf Coast	94	0	94
North	92	1	93
Panhandle	44	8	52
Corpus Christi	114	0	114
San Antonio	33	4	37
West	213	12	225
West Central	84	17	101
Utah, North	9	0	9
South	15	0	15
Washington	1	0	1
West Virginia	6	211	217
Wyoming	61	7	68
Reported U. S. total	**1,904**	**625**	**2,529**

*Report to AAODC by the International Oil Scouts Association.

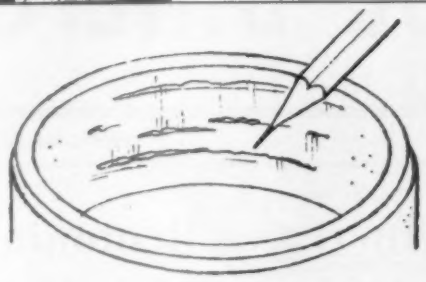
†As of August 19, 1960.

Not reported: Arkansas, North; Kansas, East; Montana; New York; Oklahoma, except Panhandle; Pennsylvania, South; Tennessee.

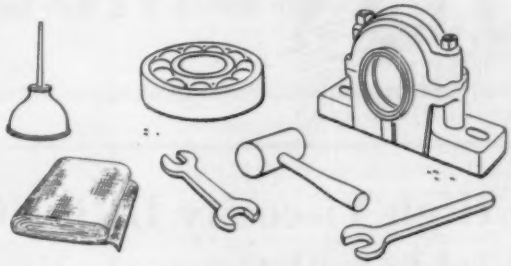
DISTRIBUTOR DAN the SKF bearing man, tells

WHAT DIRT DOES TO BEARINGS

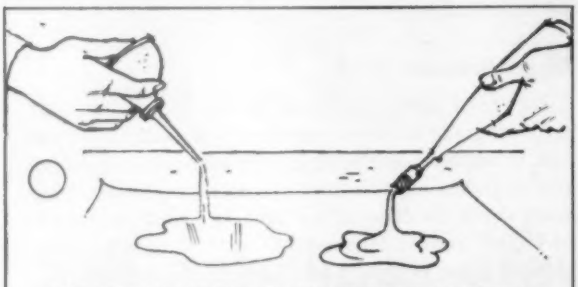
—and how you can help keep it out



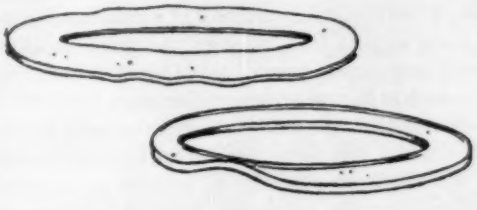
LOOK FOR POLISHED, CLEARLY-MARKED BALL OR ROLLER PATHS. They're sure signs that dirt is getting into your bearings, causing lapping of the parts and ultimate failures. To eliminate this problem, follow the steps shown here.



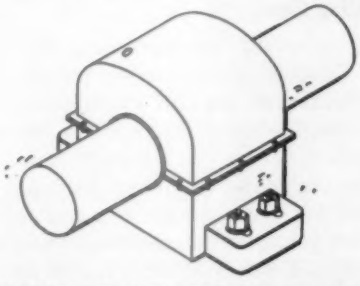
START WITH GOOD "HOUSEKEEPING." Work with clean tools in a clean area. Before you replace a bearing, clean the housing—both inside and out. Always handle a used bearing as carefully as you would handle a new one.



LOOK OVER YOUR LUBRICANTS AND LUBRICATING EQUIPMENT. Dirty oil and grease carry foreign matter with them, right into the bearing. So check them for cleanliness before you use them —and your grease guns and oil cans, too.

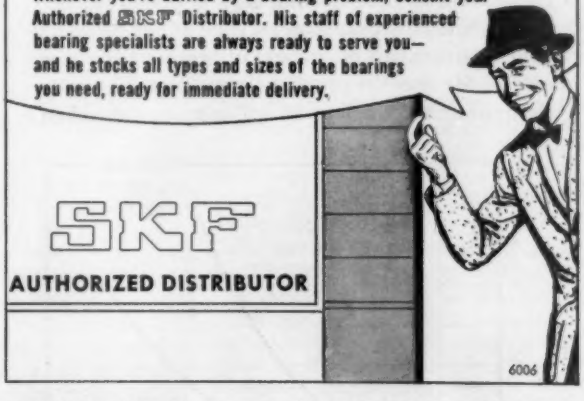


IS THE SEAL BENT OR WORN? If it is, dirt and dust and other foreign matter can get into the bearing. If moisture or water is present, you'll need seals made of special moisture-resistant materials.



WHERE DIRT IS A CONTINUAL PROBLEM, try shrouding the bearing housing in a metal box like the one shown here. It's inexpensive, easy to build and helps deflect dust and dirt away from the bearing.

Whenever you're baffled by a bearing problem, consult your Authorized SKF Distributor. His staff of experienced bearing specialists are always ready to serve you—and he stocks all types and sizes of the bearings you need, ready for immediate delivery.



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DRISCOSE BRIEFS

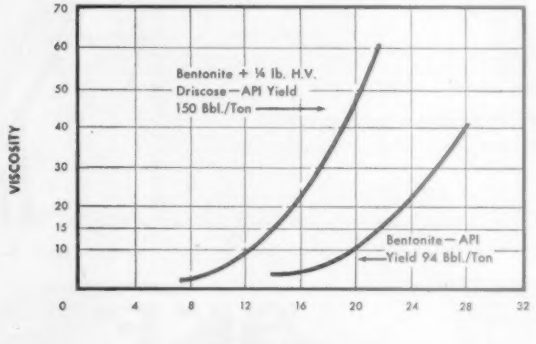
DRILLING DATA REPORT 60-3

High Viscosity DRISCOSE* Increases Bentonite Yields and Controls Viscosity Of Low Solids Muds

As drilling costs continue to rise, contractors and operators are looking for more and better ways to economize. For years our engineers have been showing them how low solids muds made with Driscose help keep drilling costs to a minimum. We're accustomed to getting good reports from all over the globe about the many money-saving benefits that Driscose makes possible—such as increased penetration rates, extended bit life, low water loss and many more. Just recently, though, we've heard a surprising number of comments about how well Driscose performs in souping up bentonite yields and controlling viscosity. These are old tricks for Driscose and are often taken for granted by mud engineers.

How Much Driscose to Control Viscosity?

Our High Viscosity Driscose, as the name implies, is highly effective as a viscosifier. The graph below shows a big increase in viscosity with only ¼ pound per barrel of High Viscosity Driscose. A ratio of one 50-pound sack of Driscose to 8 or 10 sacks of bentonite is a common cure for viscosity problems in the field. Naturally, the requirements of any given well must be considered, but, in general, a low solids mud system can be controlled with less than ½ pound per barrel of this 99+% pure product.



Effect of High Viscosity Driscose on viscosity and bentonite yield.

Bigger Bentonite Yields

Long before low solids muds became so popular, our medium grade Driscose had already proved itself as a fast, economical treatment to increase bentonite yields. Our High Viscosity Driscose is even more efficient. The chart shows the effect of less than ¼ pound per barrel of High Viscosity Driscose on the API yield—a 60% increase from 94 to 150 barrels yield per ton. Our research people have shown us that a ratio of one pound of High Viscosity Driscose to 1¾ pounds of bentonite will produce a mixture with an API yield of approximately 2200 barrels per ton.

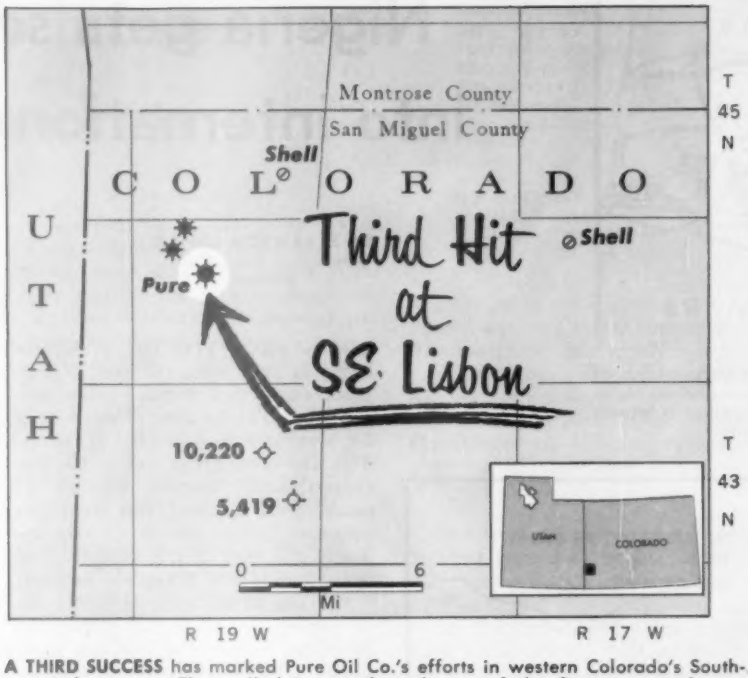
Reduced Drilling Costs

Our field data proves that operators using low solids, high-viscosity Driscose muds can expect big savings in mud-up costs because the need for bentonite and other additives is so greatly reduced. But in addition to lower initial mud costs, the effects of controlled viscosity can and do produce sizable savings through faster penetration, longer bit life, fewer fishing jobs and reduced downtime. When you figure the cost of downtime from $30 to $300 and up, a little Driscose to control the mud system is an economical buy.

For more details on money-saving, low solids muds made with Driscose, see your nearest mud service dealer . . . or write us direct for technical literature.

*Driscose is a trademark for Sodium Carboxymethylcellulose

DRILLING SPECIALTIES COMPANY
Bartlesville, Oklahoma



A THIRD SUCCESS has marked Pure Oil Co.'s efforts in western Colorado's Southeast Lisbon area. The well, lying south and east of the first two producers, promises to be the best one yet completed.

Salt anticlines draw new interest in Paradox basin

BY FRANK J. GARDNER

FOR MORE than a year now, Pure Oil Co. has been probing the two-state Lisbon anticline. While others have joined in the play, this one operator has been the signal caller all along the Utah-Colorado line. In Utah at the northwest end of the structure, Pure has three assured producers (OGJ, June 27, 1960, p. 185). Now, it appears that the company has its third one at the southeast end, in San Miguel County, Colorado.

Three shut-in wells . . . On first test of its 3 SE Lisbon-USA in Section 16-44n-19w (arrow on map), gas flowed at a rate of 6,350 M.c.f. per day plus 70 bbl. of condensate in 15 minutes. Flow was through ½-in. choke. Perforated interval was 9,054-62 ft. in Mississippian. Pure drilled the test to total depth 9,524 ft. and set production string to 9,192 ft. Top of the Mississippian was called at 8,904 ft.

The new producer lies 2½ miles south of the original field discovery, Pure 1 Government-SE Lisbon (Section 5-44n-19w) and 1½ miles southeast of the second well, Pure 2 SE Lisbon-USA (Section 8-44n-19w). All three wells are now shut in.

And two pay zones . . . The second and third wells here are apparently much better prospects than the first, though official completion has been filed on none of them. The discovery well had a thorough coring and testing program and recorded maximum flow of 3,460 M.c.f. gas per day from Mississippian perforations at 8,780-8,810 ft. The confirmation well, 2 SE Lisbon-USA, flowed a maximum of 6,480 M.c.f. gas plus 136 bbl. condensate per day from Mississippian at 8,674-8,784 ft. and found commercial pay in the Ouray-Devonian at 8,821-62 ft. where it gaged 6,128 M.c.f. gas per day.

Where the play will jump now is Pure's secret, but rumor has it that the fourth well has been staked, probably to the north or northwest of the discovery well. It is no secret that the operator would like to see the entire 15-mile trend between Northwest Lisbon, Utah, and Southeast Lisbon, Colorado, welded into a great belt of rich gas-condensate producers. This may come to pass, but not before a lot of geological brains have been worn to the nub and not without some "geological victories" in the guise of dry holes.

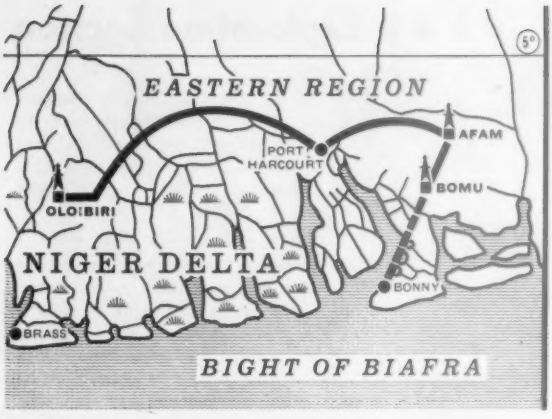
On large structures . . . Published work of the United States Geological Survey should be most helpful in unraveling some of the puzzles of Lisbon Valley. The anticline itself is elongated northwest-southeast and underlies the valley. It is a salt anticline, and unlike most such structures, the salt is believed not to have intruded the overlying sedimentary rocks.

Meanwhile, northeast of Pure's Southeast Lisbon hits, Shell Oil Co. is busily sinking two remote wildcats on another of the Colorado Plateau's salt structures. On the elongated Gypsum Valley anticline, in Section 8-44n-17w, Shell's 1 North Gypsum Valley unit is drilling below 10,000 ft. on a 12,000-ft. Mississippian contract; to the northwest (see map), its 1 West Gypsum Valley, a 10,000-ft. Cambrian test, is drilling near 8,000 ft.

The Gypsum Valley anticline is one of the most complex uplifts in this part of the plateau country. Unlike Lisbon, it is a salt-piercement structure and is more highly faulted. The two Shell wells will be closely watched as precedent-setters for exploration of other salt anticlines.

Separating the Lisbon and Gypsum Valley anticlines is an elongate, sinuous downwarp known as Disappointment syncline. Shell and Pure geologists obviously are whistling in the dark as they select new locations in the two anticlinal areas.

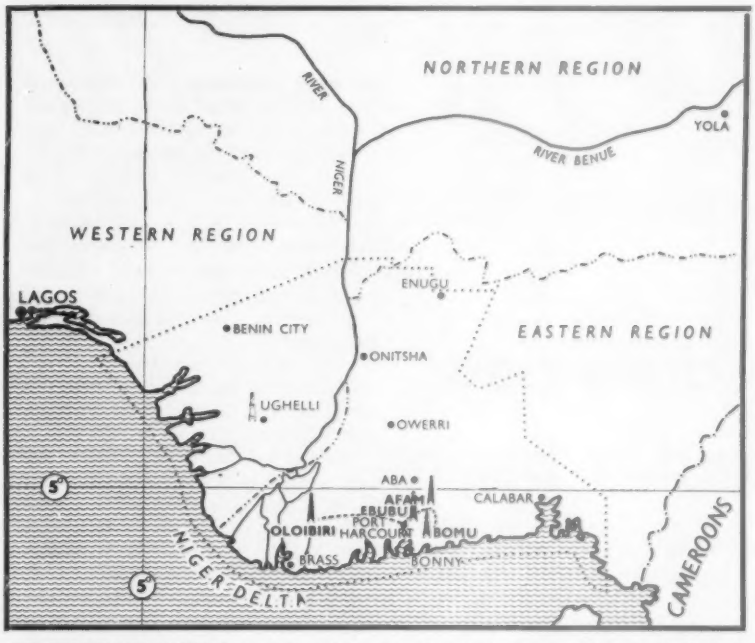
Should lead to big fields . . . These successes, and the wildcatting programs they encourage, some day will lead to a realization of the Paradox basin's true potential. It's hardly been touched so far, despite events in the Aneth region.



THIS IS the geographically forbidding Niger Delta region of Nigeria where oil hunting is difficult. Map shows oil fields at Afam, Bomu, and Oloibiri. Proposed pipeline is shown by dashed line; solid line is existing pipeline.

Nigeria gets set into international

BY E. LAWSON LOMAX
Petroleum Consultant,
London



OIL SEARCH IN NIGERIA is depicted by this sketch showing activities of Shell-BP Petroleum Development Co. of Nigeria, Ltd. Dashed lines are pipelines, dotted lines are license boundaries, black derricks are producing wells, while empty derrick is discovery at Ughelli.

THE SEARCH FOR OIL in Nigeria began in 1937 when the Shell-D'Arcy group—now Shell-British Petroleum—was granted exploration concessions in an area involving 40,000 sq. miles. This was in the Delta area of Nigeria. Geographically situated about 5° north of the Equator, this sector experiences 120 to 140 in. of rain annually and most of it is comprised of dense forests and Mangrove swamps.

It is one of the most difficult types of terrain for geological-geophysical programs. Progress at first was slow. Initial efforts consisted of shallow drilling and aerial surveys. All operations were suspended when the war came in 1941. It was September 1946 before work resumed.

Climatic conditions are as severe as any oil-potential tropical land in the world, with the possible exception of Papua. In the rainy season humidity hovers at or is just below 100%. Practically continual low-flying mist and water-saturated earth defy exploration work. The dry season is little better. These delaying and aggravating factors show why it took until 1953 to map 5,000 miles. Before the mapping program, one deep wildcat was drilled at Ihuo, 10 miles northeast of Owerri, to a total depth of 11,228 ft. and no shows were encountered.

Upon completion of mapping, exploratory drilling was carried out in several locations and the first oil well

Drilling Operations in 1960

Well	Location	Status
1 Ozo	7 miles west of the Afam field	Drilling.
1 Kwa Ibo	Mouth of Kwa Ibo River	Abandoned February 1960.
1 Santa Barbara	Drilling from barge 15 miles southwest of Oliobiri field	Drilling suspended.
1 Opobo South	Uyo Province	Dry hole at 11,250 ft.
14 Bomu		Struck oil February 1960. Testing.
1 Ramos River	Delta Province	Spudded March 1960.
1 Buguma Creek	Degena Province	Struck oil at 12,195, April 1960.
1 Dimneze	Owerri Province	Dry hole at 10,512, March 1960.
15 Bomu		Struck oil May 1960.
16 Bomu		Dry hole.

to move markets

was drilled to 11,121 ft. at Akata, Calabar Province, in November 1953. Seven more tests were drilled in the area and the results were disappointing. Two were dry holes, another pair encountered small amounts of gas, and two were abandoned because of hole difficulties.

An eight-well exploration program was conducted in a 3-year interval between 1953 and 1956. Five of these efforts had small oil and gas indications but none were commercial.

Encouragement comes at Oloibiri. At a site 45 miles west of Port Harcourt at Yenagoa, the first promising strike was made at a Oloibiri well drilled to 12,008 ft. From the time this well was completed to the end of 1959, a 60-well drilling campaign was completed. About half the tests were oil or gas bearing. Three proven fields found included those at Oloibiri, Bomu, and Afam.

The Afam discovery well was drilled in 1956 20 miles northeast of Port Harcourt in Umuahia Province. The producing horizon was found at 10,024 ft. In 1957 four more tests were drilled; two were oil, and two were dry. During 1957 and 1958, another field was found at Soku, Rivers Province, 30 miles west of Port Harcourt, in a zone at 11,557 ft., making this the third producing region.

Before Shell-BP discovered these three oil-bearing regions, $75 million had been spent in exploration and about $56 million expended in the 4 previous years. The Soku well was the seventeenth exploratory well drilled in Nigeria. It is evidently felt that the money was well spent, because Shell-BP continued this costly program. Practically no geologic information has been released on these fields and only an idea of some of the problems encountered are indicated from observation of conditions at the Soku well site.

Diverse problems occurred at Soku. Swampy ground at the location of the first well prompted the operators to haul sand and make an island upon which the Ideal 100 rig was erected. Crew quarters were built nearby. Following the completion of the first effort, it was decided that building each location with hauled sand was too expensive for subsequent development.

A specially designed marine barge and tender was decided as the most logical approach to the problem. The tender, built in Holland, arrived at Port Harcourt in October 1957 and put to work. The cost of the basic unit with its auxiliary equipment, including a helicopter platform, ran $3,500,000.

The early exploratory tests cost a minimum of $280,000 and some ran as much as five times this amount. The operators then evaluated the results of the first 17 tests to see if the over-all effort was worthwhile. It was decided to continue operations on an appraisal system. At the end of 1958, a total of $112 million had been expanded in the Nigerian oil search.

Another important consideration was transporting the crude. A 65-mile, 10-in. pipeline was built from Oloibiri to Port Harcourt so that the oil could be delivered directly to the sea instead of barging it. The line and pump stations is estimated to have cost $2,800,000.

At year end in 1958, 35 wells were drilled. During the next year another 35 increased the number of wells to 70. Of these, 26 were producing. Oloibiri and Afam fields were put on test production at the end of 1957. First shipment of crude was made in February 1958. Total crude export was 1,900,000 bbl. during that year. In the first full year of 1959, total oil exported was 4,066,542 bbl. (553,360 tons), and this is expected to increase

NIGERIAN EXPORT CRUDE INSPECTION OF CRUDE OIL

Gravity	API	30.2
Specific gravity	60° F./60° F.	0.870
Sulfur content	% wt.	0.16
Pour point (upper)	° F.	55
Viscosity at 100° F.	centistokes	6.3
Asphaltenes (IP 143)	% wt.	<0.05
Vanadium	p.p.m.	<1
Propane & lighter	% wt.	0.15
Butanes	% wt.	0.45
Salt	lb./1,000 bbl.	ca 40 (variable)
Water	% vol.	ca 0.5 (variable)
Distillation (IP 24)		
Dist. + loss to 150° C.	% vol.	14
Dist. + loss to 200° C.	% vol.	24
Dist. + loss to 300° C.	% vol.	51

PRODUCING FIELDS IN NIGERIA

Field—	Discovery year	Flowing wells	Total wells	Type of crude	API gravity	Geological formation	Production 1959 in bbl.
Oloibiri	1956	10	16	Paraffin	22	Miocene	1,725,583
Afam	1957	6	13	Paraffin	43	Miocene	1,736,800
Bomu	1958	6	12	Paraffin	32-38	Miocene	358,878
Ebubu	1958	4	4	Paraffin	27.5	Miocene	756,308
Okoloma	1959	1	1	Paraffin	50	Miocene	25,827
Elelenwa	1959	1	1	Paraffin	38	Miocene	23,026

NIGERIAN EXPORT CRUDE PRODUCT YIELDS AND QUALITY

	Excess gas	Butanized gasoline	Kerosine	Gas oil	Heavy gas oil	Atmos. residue	Vac. distillate	Vac. residue
TBP range from ° F.	...	.....	300	450	650	above	700	above
to ° F.	...	300	450	650	700	700	977	977
Yield on crude % vol.	0.2	12.7	13.75	29.8	5.9	37.65	26.75	10.9
Yield on crude % wt.	0.3	14.75	14.55	29.95	5.8	34.65	25.2	9.45
Specific gravity—60° F./60° F.	...	0.744	0.822	0.8655	0.8905	0.945	0.923	1.005
Total sulfur—% wt.	...	0.004	0.028	0.11	0.21	0.29	0.23	0.44
Mercaptan sulfur—% wt.	...	nil	0.001	.....	.....	.....	.....	.....
Octane number—clear	...	72.5	.....	.....	.....	.....	.....	.....
Paraffins—% wt.	...	33.0	.....	.....	.....	.....	.....	.....
Naphthenes—% wt.	...	58.5	.....	.....	.....	.....	.....	.....
Aromatics—% wt.	...	8.5	17.4	.....	.....	.....	.....	.....
Smoke point—m.m.	...	.....	19	.....	.....	.....	.....	.....
Cold test—° C.	...	.....	60	.....	.....	.....	.....	.....
Diesel index	...	.....	.....	49	46	.....	.....	.....
Pour point—° F.	...	.....	.....	5	65	105	.....	125
Viscosity at 100° F.—centistakes	...	.....	.....	4.1	12.7	(485)	.....	.....
Viscosity at 210° F.—centistakes	...	.....	.....	.....	.....	21.3	.....	1,050

in 1960 to about 30,000 bbl. daily or 1,500,000 tons for the year.

Refinery is contemplated. The question whether to build a refinery to take care of the Nigerian crude was posed. In August 1959 a team of experts was sent from the United Kingdom to make the preliminary studies. Their conclusions have not yet been revealed. It was decided to build a deep-water tanker terminal at Bonny. There the water is deeper than at Port Harcourt and even with dredging at Port Harcourt the water would be shallower than at Bonny. Dredging is scheduled for completion late in 1960. Pipelines are being built from all presently producing areas to Bonny and upon completion will have a combined capacity of 80,000 bbl. daily.

The first oil in West Nigeria was discovered in the Ughelli Delta Province on the sixth effort following five dry holes. Drilling is still going on in this province at Nun River, 35 miles west of Brass.

An appraisal of the picture in Nigeria after a full year of established production was announced by Shell-BP Petroleum Development in May 1959. The report stated that the first tentative stage of operations had ended and a long-range program had begun. During 1959 the firm had spent over $17 million and the total expenditure was $168,000,000 for oil exploration. Income from production during the year was $7,500,000. As long as expenses continue in excess of twice the yearly income, it appears that the company will continue its operation several more years without the hope of breaking even.

The outlook for Nigeria. All crude presently produced in the country is light and sweet (see accompanying charts). The world market is currently a stiff situation to break into because of general overproduction. With high producing costs, generally poor accessibility to the fields, and an over-all small average yield (less than 1,000 bbl. per day) of the wells; Nigeria has its problems.

There are two alternatives: the country can build a small refinery to take care of its domestic demands and export the rest of its crude; or it could refine all its crude and export all its surplus. Actually its own consumption is small—a 500,000-ton per year plant will fill its demands. With its total potential production anticipated as 4,500,000-5,000,000 tons yearly, only one tenth is required at home, leaving a large surplus for the world market. It is not likely that the nation will refine any more crude than it actually needs. One thing is certain—Nigeria will stake its claim for a share in international markets.

THE OIL-BARREN MARFA BASIN in far upper Big Bend country of West Texas will get an interesting 10,200-ft. wildcat. Gulf Oil Corp. made location for this wildcat in the north central part of Presidio County, 12 miles southwest of Marfa on a 3,270-acre lease. The 1 H. J. Hubbard is to be drilled in Section 74, Block 8, GH&SA Survey. Nearest production is about 60 miles northeast in the Delaware basin. There has been very little exploratory activity in this small basin, one of Texas' last wildcat frontiers. This section of the state is covered with Cenozoic, Cretaceous, and undifferentiated igneous rocks.

New book ready on Sooner water floods

A revised analysis of water-flood action in Oklahoma oil fields has been prepared by "Research Oil Reports."

The growth of water-flood work is shown by the number of new projects reported. The current work covers 704 secondary-recovery projects, compared with just over 600 last year and slightly more than 500 during 1958. Data given are thought to be reliable, but have not been individually checked.

Latest available figures are included in the new book, and cover the 12 months since the last water-flood book was published. Production figures are presented in easy-to-use form. Figures include efficiency factors for both oil and water production, number of acres involved in the flood, and other data.

Almost all major operators in the state, plus many independents, are engaged in flood projects ranging from 20 acres to more than 20,000 acres.

The current book shows that 372,520 acres are now involved in secondary-recovery projects. This is an increase of several thousand acres over the 1959 level. Fluctuations in production, whether a seasonal decline or from an engineering standpoint, are also shown in the volume.

"Low maintenance cost sold us on Edward Mudwonder Valves,"

says Jess L. Warton,
Warton Drilling Co.,
Odessa, Texas

"Everybody knows that drilling contracting can be a tough business. And, those of us who make a living at it would be the first to say so. Yet, the difference between success and failure is often a very subtle matter.

"In my experience, making a go of it hinges largely on having plenty of know-how and experience in drilling, plus first-class rigs and other equipment, plus well-trained crews and tool pushers. Men and equipment have to be tops, and they must also work well together.

"For example, a successful drilling contractor has to be especially careful about selecting engines, pumps, valves, drill bits and other operating gear. The difference between best and next-to-best is the difference between a profit and no profit. Mud valves are a case in point.

"We found that Edward Mudwonders required less maintenance than the others. We now follow a program of switching to Mudwonders whenever other mud valves wear out and require more and more maintenance."

For additional information on Edward Mudwonder valves, see your favorite oil field supply store, or write Edward Valves, Inc., 1212 W. 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.

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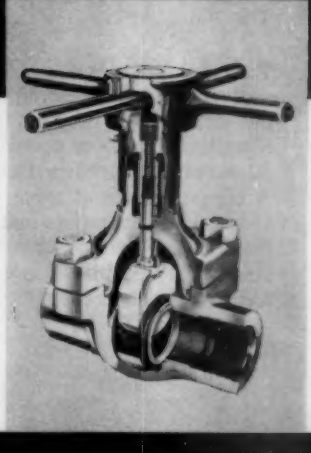
Jess L. Warton, Owner, Warton Drilling Company, shown at Rig #3 on lease near Andrews, Texas.



Mudwonder cut-away view shows the one-piece seat insert with Buna-N molded integrally over steel wear rings; chrome gate with "T" slot connection; separated stainless stem and double thread construction.

Third step in hunt for oil is Gulf probe

THE SUNSHINE STATE has long been an enticing but elusive place to look for oil. Success has been scanty but hopes for big oil remain high.

FLORIDA OIL-SEEKERS are probing into the Gulf of Mexico in their continuing search for production in a province that has baffled drillers 281 out of 293 trys. For years operators have plied the swamps, Everglades, and rolling country of the northwestern part of the state looking for oil. The score is one oil field and one abandoned pool.

Off the west coast

... California Co. has agreed to drill a 13,500-ft. wildcat 4 miles seaward of La Costa Island off Lee County.

Calco will be drilling on a vast 4.5 million-acre lease owned by Coastal Petroleum Co. All Florida offshore wells drilled by Calco and others have been dry, but majors still pour lots of exploratory money into the state. The La Costa Island well will be drilled in 18 ft. of water to at least 13,500 ft., the second-deepest try off the coast of western Florida. Location is about 25 miles northwest of Fort Myers and 150 miles north of Gulf Oil Corp.'s 15,294-ft. wildcat off Marquesas Key in the Florida Keys. That Gulf well was the first in open gulf waters.

Too few tests

... over such a large area has been one factor in the lack of new oil for Florida. Since 1943, when Sunniland field was opened in Collier County, only 32 holes deeper than 10,000 ft. have gone down. A big percentage of these wildcats did find good oil shows, enticing majors and independents to keep up the Florida hunt. Florida covers about 36 million land acres and about as many water-bottom acres, most of which are on the Continental Shelf in the Gulf of Mexico. This vast shelf area and the land acreage throughout the state have kept companies busy leasing for years. Florida has more acreage under lease than any other state in the Southeast.

Why no oil

... in the eastern Gulf of Mexico? Florida with only one producing field, Sunniland, is bordered on the northwest by Alabama with four oil fields, one of them a major producer. South of Florida, Cuba has six oil fields making more than 1,000 bbl. per day. Florida's production is limited to the Everglades 90 miles northwest of Miami where 11 wells are producing 1,000 bbl. daily from Sunniland Glen Rose Lower Cretaceous lime below 11,000 ft.

The state almost had a second oil field with the discovery of Forty Mile Bend in Dade County, 40 miles west of Miami. Two wells made 33,000 bbl. before the field was quit due to technical troubles. It is good to note that it is estimated that this 33,000 bbl. is less than 5% of the oil in place under the two locations.

The Florida hunt for oil has been widespread from the panhandle counties on the far northwest down through the state to the Keys. Most of the southern part of the peninsula is known as the South Florida embayment. It is here that most people think Florida's oil will be found. The thick deep Cretaceous sediments have hardly been dented. It will probably take many wildcats down to ultra-depths to unlock the oil that will give Florida more than one field and give the eastern Gulf Coast that "green" look of its neighbors to the west.

—John C. McCaslin

Tristate area reports action

All three states in the Illinois basin were heard from last week.

In Illinois' Macon County, Pure Oil Co. has a wildcat discovery at 1 Whitley unit in NE NE NW 28-16n-1e, 6 miles west of the city of Decatur. The well is a Silurian discovery at 1,948-60 ft. D. T. Drilling Co. will test in Rosiclare at 2,976-81 ft. at the 1 E. F. Conour in SW SW NW 28-4n-10e, 1 mile northwest of Olney and ½ mile north of Rosiclare production in Richland County. Recovery on a drill-stem test was 1,430 ft. clean oil. The discovery well of Rosiclare oil here was 1 Getz in NEc 32-4n-10e. It pumped 336 bbl. per day from 2,980-87 ft. The north offset discovery, 1 Clodfelter Heirs in the SEc 29-4n-10e, pumped 336 bbl. per day from 2,979-88 ft.

Indiana. Mayhew Oil Co. completed 1 Raymond Happe in NE NW NE 29-5s-12w, 1 mile southwest of Blairsville in Posey County. The well pumped 40 bbl. of oil and 15 bbl. water daily from McClosky lime at 2,740-49 ft.

Kentucky. Cox Drilling Co. may have a discovery 2 miles northeast of Red Hill Church in 9-N-30, Daviess County.

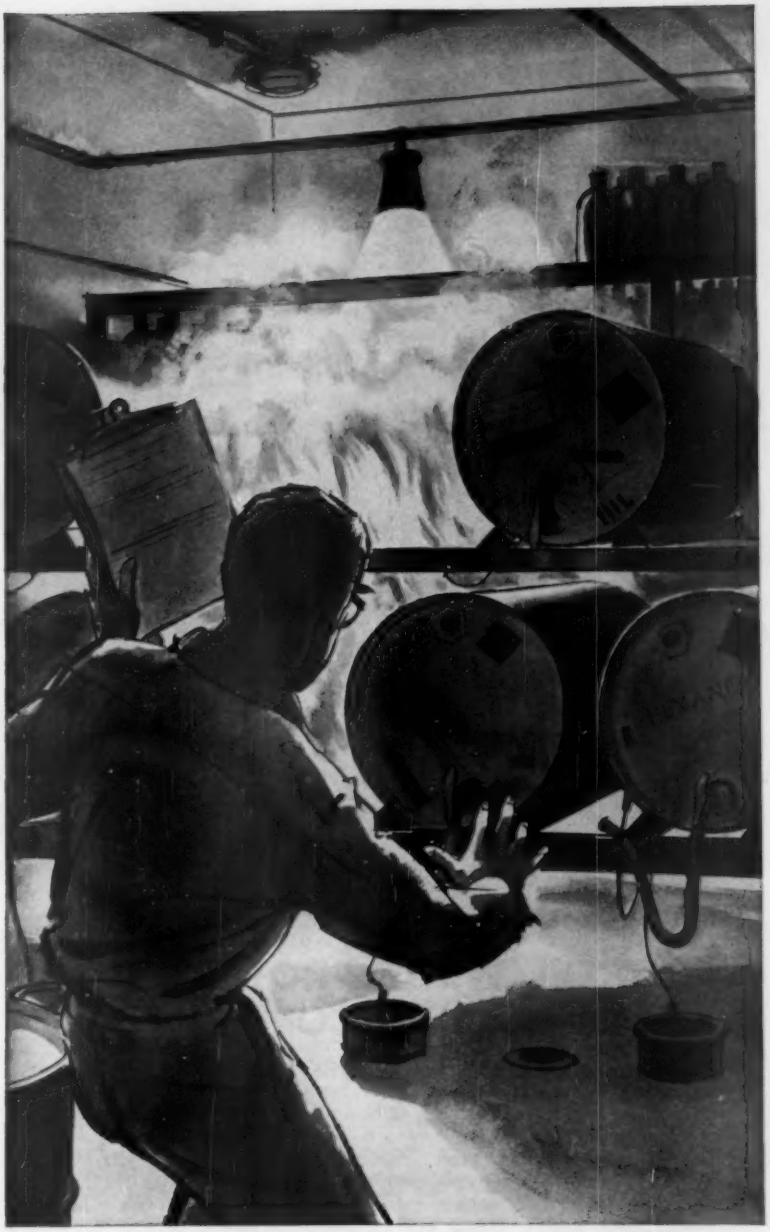
The 4 First National Bank tested 12 bbl. per day, natural, from Aux Vases lime at 1,228-33 ft. Operator is acidizing.

In Henderson County, M. W. Prince 1 Ohio Valley Trust, 17-P-25, 4 miles northeast of Anthoston, pumped oil from Aux Vases at 2,282-90 ft. On swab tests the well made 2 bbl. per hour, natural, 6 bbl. per hour after acid.

Production indicated in Alberta well

IN CANADA, Pan American Petroleum Corp. has indicated production along another trend in the general Crossfield-Carstairs district of southwestern Alberta.

That district of the province is currently undergoing one of its most active periods and the exploration and development is certainly paying dividends. The most recent discovery in the region, however, is radically different from the Cardium oil development that has kept it in the spotlight during the past 8 months. The new discovery well found Mississippian wet gas at a very favorable rate and



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is sure to spark even more interest during the next few months.

Crossfield. This strike, Pan American-Fargo-G-1 16-14-28-1 Crossfield, on LSD 16-14-28-1w5, is located to the east of previous production and the closest previous test is some 6 miles southwest. Other exploration in the immediate vicinity includes another abandonment 8 miles northwest and yet another dry hole the same approximate distance east.

The new find uncovered an approximate 120-ft. pay sector in the Elkton zone of the Mississippian horizon. The discovery horizon was topped at the 7,570-ft. level and the drill-stem test of a 62-ft. interval immediately below that contact point flowed condensate-bearing natural gas at an estimated rate of 10 M.M.c.f.d.

This is Pan American's second Mississippian success in the immediate district in the past few weeks. The initial venture, however, is thought to be an extension of the previously discovered Mississippian gas in Crossfield field. The new well is 5½ miles east of that success and while it is capable of producing from the same strata the difference in elevation of the two wells indicates that the recent discovery is on a separate trend.

Greater role. With the new find, this area of Alberta is bound to play an even greater role in the gas export picture. What with Calgary field, which production is under contract to Westcoast Transmission Co., only 12 miles south-southeast and Crossfield field, which gas production is scheduled for delivery to Pacific Gas Transmission through its Alberta affiliate, Alberta & Southern Gas Co., Ltd., only 6 miles west, it seems reasonable that further development of the new strike could see either line extended. Trans Canada Pipeline Co. is presently purchasing gas in Carstairs field 11 miles northwest; the well is favorably located as to market outlet.

While Pan American drilled the new discovery and the previous extension success, a Canadian independent firm will reap equal dividends from them. Fargo Oils, Ltd., of Calgary farmed out the lands to Pan American for both of the wells and in addition owns considerably more lands in the vicinity of them. Actually, Fargo holds rights to approximately 14,000 acres in the district of which 2,560 acres are included in the Pan American agreements and of which Fargo retained a 50% carried interest. The remainder of lands are wholly owned by Fargo. Pan American meanwhile controls about 9,000 acres in the district.

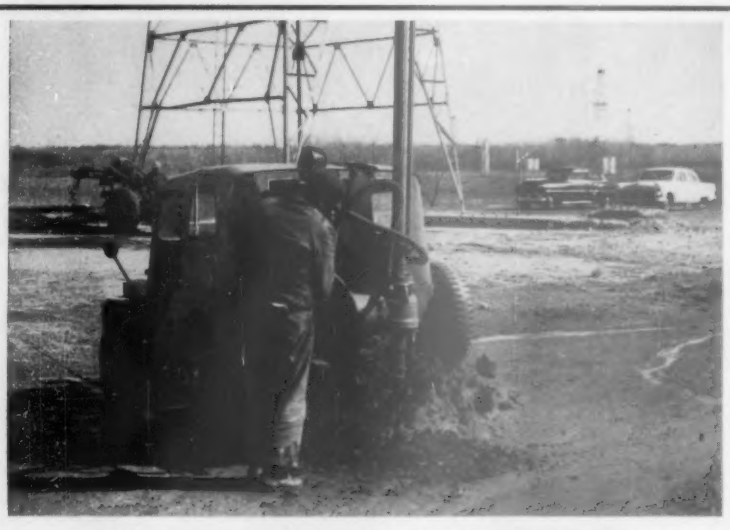
Pan American only entered this play a little over a year ago and the two new successes are its third and fourth wells in the district. The initial test drilled, 5½ miles southwest of the new discovery and 2½ miles southeast of the extension success, was abandoned while the second attempt was only 1 mile from previous success in the southern end of the Crossfield trend and was completed as a Mississippian gas well.

New Kansas pool is confirmed in Kingman

A new oil field in Kingman County, Kansas, was officially confirmed last week by a Wichita operator. O. A. Sutton 1 Lecklider, NE NE NE 23-29s-7w, a south offset to newly opened Northeast Basin field, was swabbed for 13 bbl. of oil in 5 hours from Lansing Pennsylvanian at 3,310 ft. The discovery well of the field is Pickrell Drilling Co. 1 Kostner in SE SE SE 14. That well made 120 bbl. of oil daily from Lansing at 3,764-69 ft.

Kansas geologists to tour northeastern Oklahoma

The Kansas Geological Society will hold its twenty-fifth yearly field conference September 16 and 17. The



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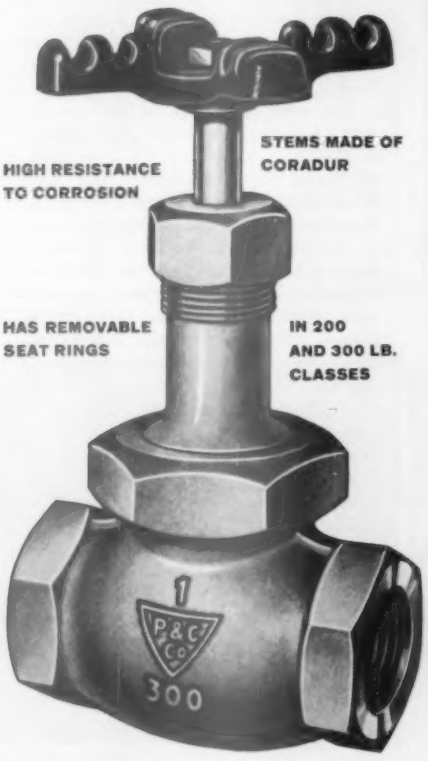

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geology of Northeast Oklahoma will be studied.

The area is next to the Ozark uplift and the McAlester basin. Rocks from the granite through the Des Moinian series are exposed. Special stress will be placed on the stratigraphy of Morrowan and Atokan series.

Leaders. Guiding the meeting will be Dr. Jack Blythe, professor of geology at University of Wichita, Dr. Carl Branson, director of the Oklahoma Geological Survey and the school of geology at University of Oklahoma, and Dr. George Huffman, professor of geology at University of Oklahoma.

Details. The field trip on Friday will be made in buses with experts to comment on the geology. Buses will leave Western Hills Lodge, meeting headquarters, on Friday morning.

Two Kansas wildcats open new producing areas

Two wildcats in Stafford County, Kansas, were completed last week, opening East Van Lieu pool and stretching Morning Star pool ½ mile northeast. The discovery well of East Van Lieu field is Dunne-Gardner Drilling Co. 1 Brown in SE NW NE 21-24s-13w. The well pumped 104 bbl. of oil daily from Arbuckle Cambro-Ordovician at 4,073-77 ft. through open hole.

The same firm extended Morning Star pool east at 1 Bowker in SW SW SE 36-24s-14w. Initial pump gage was 177 bbl. of oil per day from Mississippi at 4,038 ft.

Second well added to Southwest Kansas field

A second well in North Satanta field, Haskell County, southwestern Kansas, flowed 371 bbl. of 38.5°-gravity oil daily from Morrow Pennsylvanian at 5,251-88 ft. The well also flowed 492 bbl. of oil per day, 35° gravity, from Chester Mississippian at 5,341-5,401 ft.

The well is United Producing Co.'s 4 Kirkpatrick in SE SW 33-29s-34w. It is a northwest offset to the two-zone discovery well of the field, 1 Walton in C NW NE 4-30s-34w. That one made 144 bbl. from Morrow and 384 bbl. from Chester.

Wilcox tapped again in Louisiana

WALLACE LAKE is the name of a good new Wilcox oil discovery by McGoldrick & Watson Drilling Co. and R. H. Alagood in Catahoula Parish, eastern Louisiana.

It is 3½ to 4 miles southwest of another recently reported Wilcox discovery in the same parish which has been designated as Wallace Ridge field.

The new fields are in the general area of Tew Lake field. McGoldrick & Watson's well is about 1½ miles southwest of production. The new Wallace Ridge field, opened by H. A. Harper, is north of production.

McGoldrick & Watson's discovery well, 1 J. A. McMillan, in 15-8n-6e, is productive from the Tew Lake sand with perforations at 4,371-72 ft. It flowed on state potential test at the rate of 209 bbl. of 41°-gravity oil per day through ⅛-in. choke. Flow was with gas-oil ratio of 200 cu. ft. per bbl. and tubing pressure of 260 psi. Perforations in the top foot of 18 ft. of oil-saturated sand extending to 4,389 ft.

The Harper Wallace Ridge discovery well, 1 Beasley, produced 51 bbl. of 42°-gravity oil per day from perforated interval at 4,304-05 ft.

Along with these discoveries, another good well has been completed in the Mean Lake Wilcox field which Olin Oil & Gas Corp. is developing northeast of Tew Lake field. The new well, 1-A Wright, in 6-8n-7e, is Olin's

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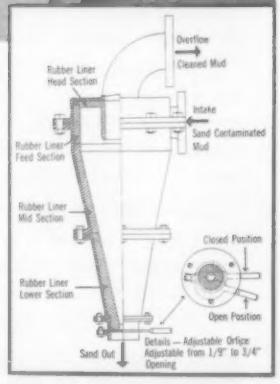

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ninth successful oil completion in the field and the third successive completion from the field's recently opened "4,200-ft." sand. The field also produced from the Tew Lake sand at 4,400 ft.

The 1-A Wright well flowed 50 bbl. of oil per day with pay perforated at 4,194-96 ft.

Pump going up at new Nebraska Cambrian find

Reagan sand Cambrian production is reported at Franco-Central Oil Co. 1 Fritz in C NW NW 1-2n-27w, Redwillow County, Nebraska.

The operator is putting up pump at the newest Cambrian find in this portion of the state. Last swab gage was 136½ bbl. of oil in 10½ hours from perforations at 3,517-24 ft. Location is 1¼ miles south of newly opened Sleepy Hollow Cambrian field in C SE SW 25-3n-27w. That Cambrian find pumped 144 bbl. of oil daily from perforations in the Reagan at 3,418-25 ft.

Richfield will try for oil in Elko, Nevada area

Intentions were announced by Richfield Oil Corp. to drill a wildcat 50 miles north of Elko in Elko County, Nevada.

The 3,200-ft. wildcat will be drilled in 42n-52e. Objective and spot are not yet reported. This wildcat lies several miles south of a 3,390-ft. wildcat drilled 3 years ago by the same firm at 1 Scott in SW SW 22-43n-52e. The Paleozoic was logged at 2,350 ft. at that well. There were some good oil shows in various cores in the well.

New Mexico's Abo trend has new reef discovery

Another addition was made to Southeast New Mexico's Abo Reef trend in eastern Eddy County. The find is Texas Pacific Coal & Oil Co. and Ambassador Oil Corp. 1 USA-Wooley, 25 miles east of Artesia in 21-17s-30e, 1 mile south of Loco Hills field.

The well flowed at the hourly rate of 20 bbl. for 3 hours through 30/64-in. choke from perforations in the Abo at 6,750-6,830 ft. Gas-oil ratio is 1,048:1. The operators have shut in at the well and are building tank.

Wolfcamp flow reported at New Mexico test

A Wolfcamp Permian oil discovery is reported in Lea County, Southeast New Mexico. The discovery well is Cabeen Exploration Corp. 1-K State, 6 miles northeast of Caprock in 11-10s-32e, 2½ miles northeast of Mascalero field.

The well flowed 364 bbl. of 43.1°-gravity oil per day on potential test through 24/64-in. choke from perforations at 8,354-8,771 ft.

Big well completed in southern Oklahoma field

East Marietta field in Love County, extreme southern Oklahoma, was extended at Texaco Inc. 1 Sadler unit in NE SE NE 13-7s-2e.

The well flowed 57 M.M.c.f.d. with 6,100 bbl. of 58°-gravity condensate in 24 hours from perforations at 10,974-11,000 and 11,012-22 ft. in Oil Creek Ordovician sands. Gas-oil ratio is 93,501:1.

Gas discovery finaled in Oklahoma's Muskogee

Muskogee County in eastern Oklahoma has a new gas-producing area as a result of successful completion of Allied Materials Corp. 1 Walker in SE SW NE 18-13n-18e.

The well, 4½ miles east of Northwest Oktaha pool, flowed 4,300 M.c.f.d. through 11/64-in. choke from perforations in the Dutcher at 1,430-60 ft.

Oklahoma Panhandle. In West Elmwood field, Beaver County, Lyons & Logan added a third well to the pool at 1 Cornell in C NE SW 29-2n-23eCM.

Calculated open flow was 25,200 M.c.f.d. from Morrow Pennsylvanian at 7,262-67 ft. This is located in an area almost linked to Mocane-Laverne field, one of the nation's biggest gas areas.

Kingfisher County. Success continues its reign here. Eason Oil Co. 2 Amalia Petru in C SW NW 21-19n-6w flowed 240 bbl. of oil per day on ¾-in. choke from Manning Mississippian at 6,692-6,737 ft. The Meramec Mississippian at 6,922-80 ft. was good for 1,200 bbl. per day on ½-in. choke.

Three zones make West Texas news

Strawn, Fry, and Gray sand discoveries feature current discovery news in West Central Texas. In northeastern Nolan County, Sherwood B. Owens 1 C. W. Tipton flowed 262 bbl. of oil daily through 24/64-in. choke from perforations in the Pennsylvanian Strawn at 5,120-28 and 5,141-46 ft. Location is 2½ miles southwest of Trent and 1¼ miles southeast of White Flat Multipay field in Section 43, Block 19, T&P Survey.

Taylor County. Jack F. Grimm 1 Zona Foster, inside Taylor County Regular Field, flowed 126 bbl. of oil

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daily plus 2% water through 14/64-in. choke from Fry sand perforations at 4,426-28 ft. Location is 7 miles west of Bradshaw and ¾ mile west of New Seven Gray sand field and 1 mile north of Joni Fry sand field. Spot location is in Section 125, Block 64, H&TC Survey.

Coleman County. Fletcher Oil & Gas Drilling Corp. completed at 1-B Bennie Smith in northwestern Coleman County, 1 mile north of Goldsboro and ¾ mile north of Goldsboro Gardner field.

The well pumped 38 bbl. of 41°-gravity oil daily through 1½-in. tubing from perforations in the Gray sand at 3,959-61 ft. Location is in the William Miller Survey No. 469. No discovery status will be asked for by the operator.

Wyoming's Arch unit field adds its eighth oil producer

Arch unit in the busy Green River basin of Wyoming has its eighth oil producer at Forest Oil Corp.-Union Pacific Railroad Co. 9 Arch 18-2 in C NW NW 18-19n-98w, Sweetwater County.

The well flowed 232 bbl. of oil daily through 32/64-in. choke from perforations in the Almond Cretaceous sand at 4,884-99 ft. This well becomes the northernmost well on the unit. Arch makes up the northern end of the fast-developing trend that includes Patrick Draw, Beacon Ridge, and Arch. The trend has consistently been the busiest area in the Rockies this year. The same operators are now readying to add the ninth well at Arch at 10-A Unit 13-3 in NW NE 13-19n-99w.

Deep gas-condensate pay for Texas well

RICH gas-condensate production has been found in another deep Wilcox discovery by Commonwealth Oil Co. in the Yorktown area of DeWitt County, central coastal region of Texas.

It is the deepest production to date in the Yorktown area and ½ mile from nearest other production. It is 6,500 ft. northeast of another slightly shallower Wilcox discovery well completed by Commonwealth last June.

The new well, 1 Hugo Wuensch, is perforated at 10,388-10,408 ft. in the lower section of the Middle Wilcox. Its open-flow potential rating is 10 M.M.c.f.d. of gas. Gas-liquid ratio is 14,850 cu. ft. per bbl. Liquid is 50.3°-gravity condensate. In tests through 12/64-in. choke, the well flowed at the rate of 2,222 M.c.f.d. of gas. Recovery was 67.36 bbl. of condensate per 1 M.M.c.f. of gas. Flowing pressure was 3,345 psi.

Commonwealth's initial deep discovery well is productive from a 9,900-ft. zone of the First Middle Wilcox pay.

In the meantime, Tennessee Gas Transmission Co. and Jade Oil Co., joint operators, are scheduling three additional deep Wilcox wells in the North Myersville area of DeWitt County. They follow the recent discovery by these operators of rich oil production in the First Massive Wilcox formation. Their discovery well, perforated at 8,135-78 ft., flowed 160 bbl. daily through 11/64-in. choke.

The same well also was completed dually in the shallower Wilcox Mac Hank sand at 8,092-8,102 ft., from which it potentialed at 20 M.M.c.f.d. of gas with pressure of 2,600 psi. The second Massive sand also had 15 ft. of oil sand at 8,320-35 ft. but was not tested.

The oil zones are being developed on 80 acres in which Tennessee Gas is the operator and Jade has a 25% interest. It is expected to dually complete the new wells either for oil or oil and gas production.

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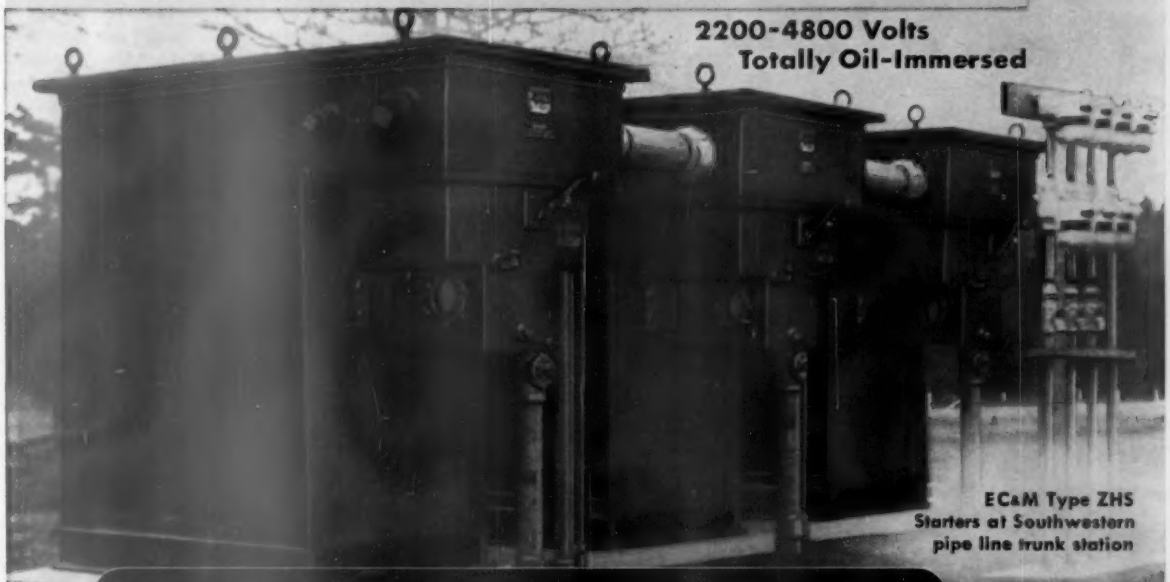

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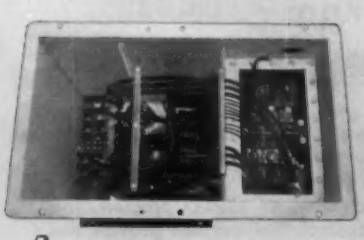
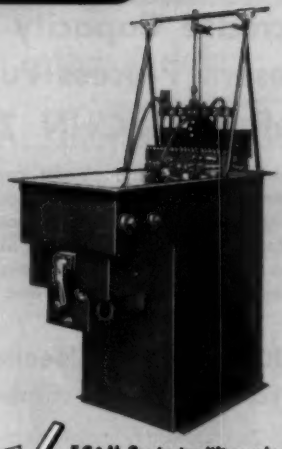
Specifically designed for Class I, Group D, Division 2, semi-hazardous locations . . . NEMA 3R (raintight enclosure). 50,000 KVA interrupting capacity.

***Fast* installation** because starters are shipped with all internal wiring complete. All leads are of anti-syphon construction.

Easy inspection • Contactor and overload relay panel may be raised, as one unit, above oil level. No disconnecting of bolts or leads. *(See lifting mechanism at extreme right.)* Safer, too . . . note view windows on each side of load-break disconnect switch.



View from above shows complete internal wiring . . . anti-syphon leads. These "ready-to-use" starters are complete with control transformer for 220 volt push button operation.



EC&M Contactor lifter raises contactor and overload relay above oil level for easy inspection. No bolts or leads to disconnect.

For literature describing EC&M's complete starter line, write for Bulletin 8131-T

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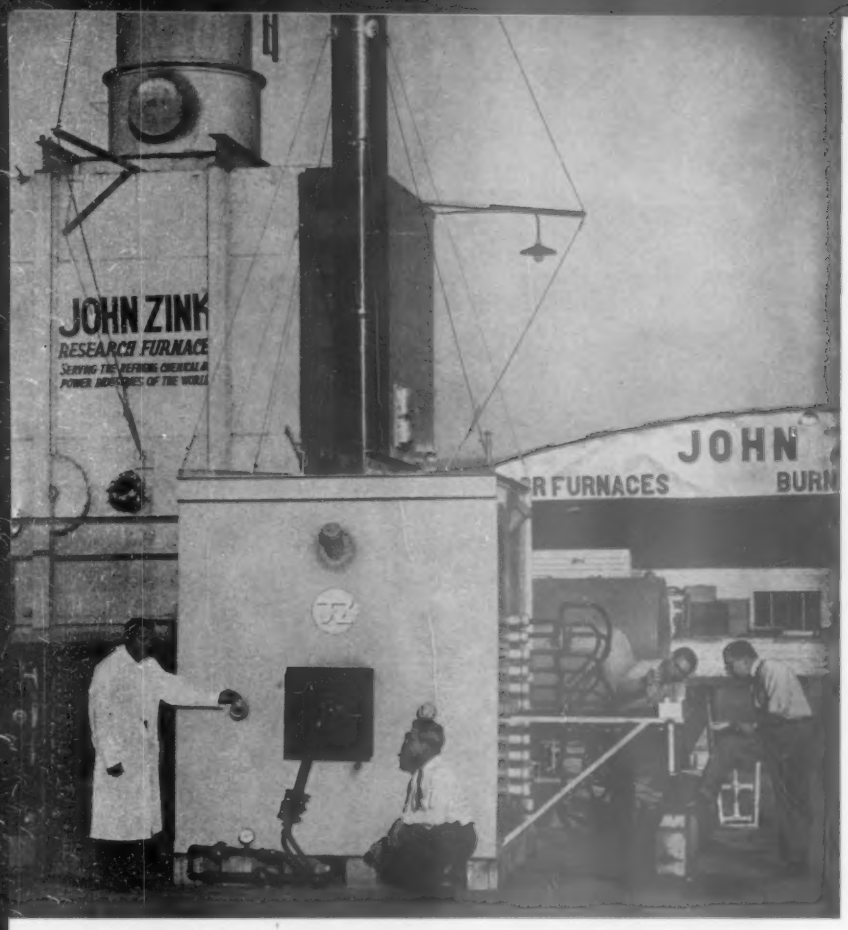

A portion of the John Zink Combustion Research Center . . . the large furnace is used for studying flame characteristics and the smaller one for studying heat transfer phenomena.

Q: How Can I ECONOMICALLY Increase Capacity In My Present Process Furnace?

A: Call The JOHN ZINK Company

More than likely, John Zink engineers can give you an immediate answer, since this is one of the process industry's constant problems. As leaders in the combustion engineering field, they probably have encountered and solved this problem for furnaces and processes like yours.
If your process or furnace presents a new, difficult, or unusual problem, the John Zink Company's outstanding test and research facilities can provide the right answer.

JOHN ZINK engineering and research can solve ANY combustion problem

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Write for Bulletin R-9, which gives detailed information on the facilities and services available.

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Michigan well allowables continue

Well allowables for the Scipio-Albion trend in Michigan will be continued at 125 bbl. per well per day.

Gerald Eddy, state oil supervisor, who issued the continuing order from June 1, when a 25-bbl. per day cut was made, said the fields would be reviewed from month to month with formal hearings tentatively scheduled for June and November each year.

Gordon Hautau, state proration engineer, reported that as of August 1 there were 203 producing oil wells in the field with 177 flowing and 26 pumping. He said the field averaged 21,580 bbl. oil per day with a well average of 107 bbl. daily in July.

Hautau said the field at present is producing only 1,328 bbl. of water per day. Average well gas ratio, he said, was 742 to 1 in July.

Pipeline - company representatives, who seldom speak at Michigan proration hearings, reported that crude markets for Michigan oil have firmed up substantially the past 30 days and forecast a "good market" situation for the next several weeks.

Harold McClure, Jr., prominent Alma independent, testified that without new discoveries the Scipio-Albion trend field is approximately 50% developed and should hit a total of 500 producing wells.

Michigan will offer 207,898 acres for lease

Lands Division, Michigan Conservation Department, will offer 207,898 acres for oil and gas lease at the September 14 lease auction in Lansing. The state lands posted for lease are scattered over 20 counties.

Biggest blocks to be offered include 59,243 acres in Presque Isle County, 54,244 acres in Alcona County, and 40,963 acres in Cheboygan County.

Posting of the northern acreage follows sharp buying for scattered lands offered earlier in the year.

Texas' Anderson has new Woodbine discovery

A Woodbine discovery is reported in Anderson County, East Texas at Concho Petroleum Co. 1 Southern Pine Lumber Co. on the L. McCann Survey, A-880. The new well is 1 mile northwest of Camp Hill field and 7 miles southeast of Palestine.

The well flowed 147 bbl. of 38°-gravity oil daily through 11/64-in. choke from perforations at 5,535½-37 ft.

Cass County. Tom Willis is testing at new oil discovery in Rodessa field, the 1 Ollie Hunt Oil unit on the T. S.

Brown Survey, 8½ miles southeast of Atlanta.

The well flowed 4 bbl. per hour through 11/64-in. choke from Mitchell sand perforations at 6,060-66 ft. The well is 800 ft. west of Caddo Parish, Louisiana, production.

West Millican field gets confirmation in Texas

The confirmation well to West Millican field in Brazos County, Texas, was completed flowing 14 M.M.c.f.d. from Wilcox at 3,398-3,402 ft. This discovery is Lonnie Holotick 1 H. H. Moore 4 miles southwest of Millican on the W. Southerland Survey. Discovery well of the field is 2 P. P. Prescott, a May discovery that flowed 12,300 M.c.f.d. from Wilcox at 3,414-17 ft.

Edwards production stretched in Texas

AN IMPORTANT 2-mile extension of upper Edwards lime production at Person field in Karnes County, South Texas, is credited to Jake L. Hamon and Glen A. Martin at 1 W. G. Reidel, 6 miles south of Gillette.

The well pumped 91 bbl. of oil plus 55% water from perforations at 10,934-88 ft. in the Edwards. Location is in the northwest corner of J. Edgar Survey, A-109. Total depth is 11,300 ft.

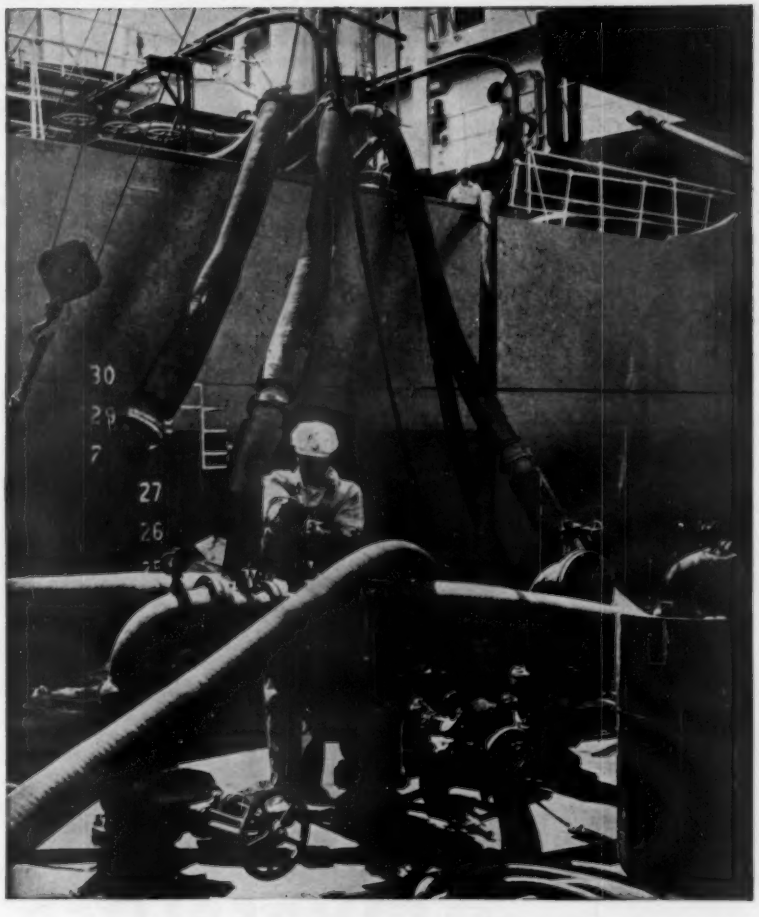
Jefferson County. A possible dual-zone gas discovery is in prospect for the area 3 miles southeast of Ameilia in Jefferson County, Texas Gulf Coast.

Oil & Gas Property Management, Inc. 1 H. C. Phelan flowed 2,100 M.c.f.d. from perforations at 7,722-28 ft. through 12/64-in. choke. Gas also flowed during tests at 7,768-80 ft. Location is 3 miles southeast of Ameilia on the S. Stivers Survey, A-51. Nearest production is 1 mile south at North Creek field.

Live Oak County. Live Oak County gained new Hockley sand oil production at McGarr & Trusler 2-B Maggie McNeil, 8 miles south of Mikeska and southeast of C. A. Winn field.

The well flowed 105 bbl. of 32.8°-gravity oil per day through perforations in Massive Hockley at 4,375-82 ft. through 8/64-in. choke. Location is Section 27, BS&F Survey, A-98.

Uvalde County. A big gas well is reported at shallow depths in southeastern Uvalde County, 10 miles south of Sabinal. The well is J. W. Gorman 3 Woodley Ranch on the Maria S.G.Y. Huizar Survey near the cor-



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It's lighter than reinforced cotton-duck hose, but it won't expand under pressure. It won't collapse under suction. It's exceptionally kink- and crush-resistant.

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Nylon tire cord for lightness, strength.

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ners of Uvalde, Medina, Frio, and Zavala counties.

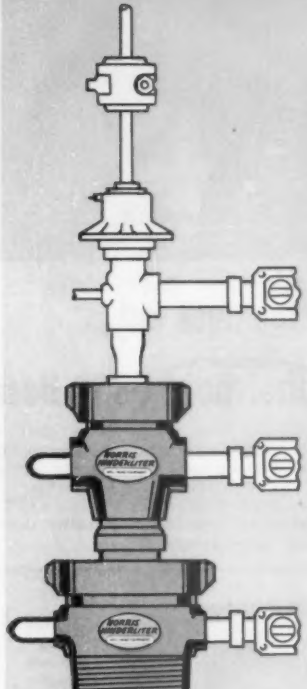
Completion was 29 M.M.c.f.d. from open-hole section between 5½-in. casing shoe at 708 ft. and total depth.

Wharton County. A shallow dry gas discovery is reported in Wharton County 2 miles west of Hungerford. Southwestern Hydrocarbon Co. and W. A. Riter 2 Phillips Chumchal flowed 8,600 M.c.f.d. from Frio perforations at 2,789-94 ft. Location is in Stephen F. Austin Survey A-4. Mary Macha Frio will be the field's name.

Zapata County. In Southwest Texas, Crescent Petroleum Corp. completed a major confirmation gas well in Northeast Lopena field. The 2 Juan G. Benavides was completed in lower Wilcox through perforations at 10,082-90 and 10,124-44 ft. On test, the well flowed 3 M.M.c.f.d. through 3/16-in. choke with 3,720 psi. tubing pressure.

Construction of a gathering system for the area will begin shortly with the first sale of gas expected before year-end. This is the third gas well completed by Crescent on a 50,000-acre block in Zapata and Starr counties, Texas.

Engineered Simplicity



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Hidalgo County. Western Natural Gas Co. will drill a 8,500-ft. test in the new gas area on the north side of Mercedes field, 6 miles north of the town of the same name.

This drilling is due to recent completion of four wells representing 12 completions—one is quadruple, two are triple, and one dual. A. W. Gregg has two wells in the area with seven zones of production. Miller & Fox has one triple well, and Tex-Star has one well with dual zones. The new well will be the 1 Southwestern Live Insurance Co. on Section 59, North Capisallo District Subdivision of Llano Grande Grant.

Hardin County. Hickory Creek field has new gas-condensate production at Atlantic Refining Co. 67 Nona Fletcher Mineral Co. The well flowed 680 M.c.f.d. from 9,500-ft. Wilcox at 9,568-76 and 9,586-94 ft. Oil flow was 404 bbl. per day from 9,440-52 ft. on 16/64-in. choke.

Matagorda County. Palacios field has a good new oil producer at Gardner-Lowe 1 State Lease, Tract 5. The well flowed 186 bbl. of oil per day through 9/64-in. choke from the upper Melbourne E-3, Segment "F" at 8,996-9,004 ft. The lower zone at 9,024-29 ft. made 180 bbl. per day through an XX-36.5 choke. Location is on the J. McFarland Survey, A-358 on state land under the Palacios River.

Washington's Grays Harbor basin may yet produce

Sunshine Mining Co. is again stirring interest in the commercial potential for oil and gas production in the Ocean City area of western Grays Harbor County.

It has been some 14 years since Union Oil Co. first developed shows in the area and some 4 years since Sunshine completed its 1 Medina as the State of Washington's first oil discovery.

Commercial production has not yet been established but interest is picking up that Sunshine and Cascade Natural Gas Co. may actually have penetrated a productive zone in their 1A Rayonier. The operators cemented 4½-in. production casing and perforated Blakeley zones at 3,738-53 ft. On an initial 6-hour production test the well flowed 5.2 bbl. of clean oil in the first hour along with gas estimated at 100-150 M.c.f.d. The well flowed mud for the remainder of the test. Subsequent 1 to 1½-hour tests have flowed clean oil at 5-8 bbl. per hour rate plus a similar amount of gas. The operators will begin a 30-day test as soon as drilling has been completed on the

(Continued on page 236)

RING OF STEEL

Defies Pressure Times Ten

The Flexitallic gasket in the bonnet joint of Hancock Steel Gate Valves cannot blow out even if pressures exceed ten times the rating of the valve. Valve maintenance and equipment down-time are greatly reduced. Made of a spiral-wound ribbon of stainless steel with asbestos filler, the gasket has spring-like compressibility — cannot be flattened.

Only the specially-designed Hancock bonnet joint with built-in compression limit can make full use of the positive sealing power of this ring of steel. Such advanced valve engineering is one example of total Hancock quality that assures trouble-free performance. Your nearby industrial supply distributor will gladly explain every economy feature of Hancock Steel Gate Valves. Phone him today.

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Personals

Merrill W. Haas, vice president and a member of the board of management of Humble Oil & Refining Co.'s Carter division in Tulsa, has been appointed exploration vice president for Humble, a new position. He will be responsible for coordination of all Humble exploration activities. Haas has been with Humble since 1933. He was named manager of exploration for Carter in 1956 and a vice president in 1957. Last year he was given a temporary assignment as assistant coordinator of the producing coordination department of Standard Oil Co. (N. J.). Haas will headquarter in Houston.

HAAS

Floyd A. Thomasson, manager of refinery sales for Frontier Oil Refining Co., a division of Ashland Oil & Refining Co., in Buffalo, N. Y., has been named special representative for Ashland's refinery sales division. He will headquarter in Ashland, Ky., **John M. Allard,** sales representative for Ashland's refinery sales department in Cincinnati, will move to Buffalo to succeed Thomasson with Frontier.

Jack Mundell, John H. Trigg Co., Roswell, N. M., has been elected president of the New Mexico Oil Scouts Association. He succeeds **Horace Underwood,** Amerada Petroleum Corp. **Jim Walker,** Sinclair Oil & Gas Co., has been named secretary-treasurer. **Jerry House,** Lone Star Producing Co., has been named editor.

James T. Wood, Jr., senior vice president and chief executive officer in Los Angeles for Texaco Inc., has retired after 30 years with the company. Wood was vice president in charge of foreign operations (Western Hemisphere and West Africa) before moving to Los Angeles in 1956. He became senior vice president there in 1957.

William Ferguson, Wichita independent operator, has organized Ferguson Oil Co., Wichita. **L. Wendell King,** land man with the old Rupp-Ferguson Oil Co., will be manager. **Keith M. Curman** will be head of the legal department and **Fred S. Lillibridge** will head the geological department.

Frank E. Merrill, Jr., has been promoted to supervisor, administrative procedures, on the staff of the general manager of Texaco's domestic producing department in Houston. He had been administrative assistant. Merrill succeeds **John C. Brooks,** who has retired after 39 years with Texaco.

W. J. Baker, production engineer for Union Oil Co. in Santa Fe Springs, Calif., has resigned to open offices as consulting mechanical engineer in Anaheim, Calif.

B. G. Casteel, process engineer at the Tulsa refinery of DX Sunray Oil Co., has been named project coordination engineer in the Tulsa headquarters office.

Joseph W. Northrop, staff geophysicist with The California Co., and **Julian W. Low,** senior research geologist, have been promoted to professional specialists.

Eugene W. Potter, Jr., formerly with Morgan Guarantee Trust of New York, has been named manager of the New York office of Van Dyke & Mejlaender, Houston independent operators.

Madison Farnsworth, general manager of Gulf Oil Corp.'s Houston sales division, has been named a consultant to Gulf's Houston marketing department. Marketing headquarters were recently moved to Houston from Pittsburgh.

Robert G. Wilson, superintendent of the Cogdell unit for Texaco Inc. in Snyder, Tex., has been transferred to Cortez, Colo., as unit superintendent.

M. W. Sherwin, formerly with Sohio Petroleum Co., has opened offices as geological consultant in Jackson, Miss., and Bellaire, Tex.

H. E. Cier has been promoted to senior research specialist in the Baytown, Tex., research and development division of Humble Oil & Refining Co.'s Humble division.

C. R. Appledorn, production engineer in Continental Oil Co.'s Odessa, Tex., production district, has been promoted to senior production engineer in the West Texas division, Midland.

Harry Jordan has been named scout in Las Palmas, Canary Islands, for Phillips Petroleum Co. Las Palmas is headquarters for most Spanish Sahara operations. Jordan has had overseas assignments with Phillips in Venezuela, Peru, and Mexico.

Donald L. Morrison has joined the Emeryville, Calif., research center of Shell Development Co. as engineer, oil reaction process.

Robert Neil Scott, geologist with Tidewater Oil Co., has resigned to open consulting offices in Bakersfield, Calif.

Paul Ishmael and **T. E. Mullins** have joined the research staff of Golden Bear Oil Co. as chemists.

R. Kenneth Barnes, geologist with Humble Oil & Refining Co., Carter division, has been transferred to Casper, Wyo., from Denver.

R. M. Crockett, manager of the coordination and economics department of Imperial Oil Ltd. in Toronto, has been appointed general manager of Imperial's transportation and supply department. He succeeds **F. C. Lantz,** who has retired after 38 years with the company. **R. B. Spears,** manager of the supply division, transportation and supply department, has been named assistant general manager of the department. Crockett joined Imperial in 1947. He had held the coordination and economics post since 1957.

CROCKETT

George R. Stocker, staff geologist for American Climax Petroleum Corp. in New York, has joined Norman W. Edmund, Barrington, N. J., independent operator, as petroleum geologist. He will be in charge of all oil and gas operations.

H. B. Howard, general manager of Texas Alberta Oil Corp., has been transferred to Mexia, Tex., from Midland, Tex.

George J. Kirn, geologist with Pan American Petroleum Corp. in Bismarck, N. D., has opened offices as independent consulting geologist in Denver.

Dr. Thomas L. Marple has been named senior research chemist at Union Oil Co.'s Brea, Calif., research center.

Edward A. Herring, engineer trainee with Continental Oil Co., has been transferred to Wichita Falls, Tex., from Fort Worth.

▶▶▶ Personals

H. T. Hunter, operating superintendent in Tulsa for Pan American Petroleum Corp., has been appointed division production superindendent for the Rocky Mountain division. He will headquarter in Casper, Wyo. Hunter succeeds **R. G. Bechtel,** who has retired after 36 years with Pan Am and its predecessors. Hunter was assistant division production superintendent in Oklahoma City before his Tulsa assignment in 1951. He has been with the company since 1934. Bechtel was Gulf Coast division production superintendent in Houston before being named Rocky Mountain superintendent in 1950.

HUNTER

Dr. Charles P. Farley, formerly with Shell Oil Co., has joined the research department of Monsanto Chemical Co.'s organic chemicals division in St. Louis.

Brooks Gutelius, president of United Supply & Manufacturing Co., Tulsa, has been elected vice president, treasurer, and a director of Western Hemisphere Petroleum Corp., Tulsa.

Neal Clayton has joined Index Geophysical Surveys Corp., Houston, as geophysical supervisor. He had been with Sohio Petroleum Co. and Geophysical Exploration Co.

D. B. Beaton, representative in Indiana Oil Purchasing Co.'s Arkansas-North Louisiana district, field operations department, has retired after 33 years with the company.

James W. Sutherland, formerly with Mobil Oil Co. in Attica, Kans., has joined the staff of the U. S. Geological Survey in Durango, Colo.

W. Kendrick, production foreman for Shell Oil Co., has been transferred to Kilgore, Tex., from Conroe, Tex. **J. H. Goatley,** exploitation engineer in Houston, has been transferred to the Midland, Tex., area. **S. E. Pollak,** gas engineer, has been transferred to Houston from Denver. **M. C. Place** and **J. J. Sekerka** have joined Shell as junior mechanical engineers in Houston. **P. R. Stewart** has joined the company as junior exploitation engineer, Houston.

William H. Kreitzer, plant operations engineer for Mobil Oil Co. in New York, has been appointed operating manager of the southwest marketing division. He will headquarter in Dallas.

Harold Barrett, gas engineer for Northern Natural Gas Co. in Omaha, has been named supervisor of operations in the gas-purchase operations department. **Wayne Brown,** well-test engineer in Hobbs, N. M., has been transferred to Omaha as gas engineer. **Orville Bruce Jones,** Omaha, has been named well-test engineer in Liberal, Kans. **James Welsch,** Liberal, will succeed Brown as well-test engineer in Hobbs. **David Lage, Jr.,** Omaha, has been promoted to supervisor of clerical service there.

E. L. Tornquist, research engineer for Northern Illinois Gas Co. in Bellwood, Ill., has been promoted to director of research and transferred to Aurora, Ill.

Lester B. Inglis, Jr., engineer in United Fuel Gas Co.'s gas measurement department, has joined the American Gas Association as assistant secretary of the operating section.

William V. Werner, plant superintendent in Ogden, Iowa, for Northern Natural Gas Co., has been promoted to superintendent of integrated operations in Redfield, Iowa.

E. N. Armstrong, superintendent of measurement for Transcontinental Gas Pipe Line Corp., has been named director of measurement research, a new position. **W. W. Cofield,** assistant superintendent of measurement, will succeed Armstrong. **Jay McElroy,** engineer in the Houston communications department, has been named superintendent of the Grover, N. C., station.

R. H. Christman, acting division chief engineer for Service Pipe Line Co.'s Wyoming division, Casper, has been promoted to division chief engineer. He succeeds **L. E. Anderson,** who has been transferred to Tulsa on special assignment.

E. Rogers Kemp, Midland, Tex., district geologist for Sinclair Oil & Gas Co., has been named West Texas division geologist in Midland. He succeeds **J. K. Lydecker,** who recently was named exploration superintendent for the North Texas division in Fort Worth. **J. R. Kiene,** senior geologist, will succeed Kemp as district geologist.

Merle E. Minks, legal adviser to Gulf Oil Corp.'s domestic marketing department in Houston, has been appointed chief counsel of Wilshire Oil Co. of California.

J. Case Wilbourn has been named assistant manager of Humble Oil & Refining Co.'s Humble division marketing department in Houston. He will be succeeded as manager of the Esso Standard division's New Jersey sales by **Guy V. Mallonee,** assistant manager of Esso's New York sales division. **Arthur A. Draeger,** manager of general office sales for the Humble division in Houston, has been transferred to New York to succeed Mallonee on a rotational assignment. Draeger had been on temporary assignment as acting manager of the northeast area of Humble division's marketing department. Wilbourn had been with the Esso division since 1932.

Robert L. Brown, assistant superintendent of Sinclair Oil & Gas Co.'s part-interest operations, has been named manager of the systems and procedures department. He succeeds **George V. B. Pearson,** who has retired.

Grover C. Colwell, vice president and a director of Parker Drilling Co., has been transferred from Tulsa to Houston to head the company's new offices there. Colwell has been with Parker since 1946. He was in charge of contact work in the Fort Worth area for several years before he was elected a director and transferred to Tulsa in 1953. He became a vice president in 1957.

Dr. Carl Gatlin has been named to succeed **Dr. George H. Fancher** as chairman of the University of Texas petroleum engineering department. Fancher joined Sinclair Research Laboratories in Tulsa last spring as vice president in charge of production research.

C. A. R. Anderson, manager of Gulf Oil Corp.'s Fort Worth sales district, has been named marketing services coordinator in the new southwestern marketing region.

Ray Huffman, Canadian Fina Oil, Ltd., has been elected first president of the new Canadian Oil Scouts Association. Other officers are **Ken Green,** Canadian Superior Oil of California, Ltd., first vice president; **Jules Poscente,** Altana Exploration Co., second vice president; **Gerry Samson,** Phillips Petroleum Co., third vice president; **Al Dennis,** Shell Oil Co., treasurer; **Cliff Fiesel,** Canadian Devonian Petroleums, Ltd., secretary; and **Bob O'Keefe,** Ohio Oil Co., editor-in-chief.

Personals

ALLEN

Fraser H. Allen, division engineer in Pan American Petroleum Corp.'s central division in Oklahoma City, has been appointed chief engineer for the company. **Lewis Finch, Jr.,** last to hold this post, was named manager of production late last year. Allen has been with Pan Am since 1940. He was district engineer in Corpus Christi, Tex., before the Oklahoma City appointment in 1955.

Robert L. Lantz, geologist with Ohio Oil Co. in Billings, Mont., and **W. F. Heagney,** Billings landman, have been transferred to Bismarck, N. D. **John D. Trout,** geologist, has been transferred to Durango, Colo., from Billings.

Russell E. Dertell, Calgary, has been elected secretary of Fargo Oils, Ltd. He will continue as head of the land department.

Myron M. Kinley, Houston oil fire fighter, will be awarded a Japanese decoration, the Fifth Class Order of the Rising Sun, in appreciation for his help in extinguishing two oil fires near Nagaoka, Japan. The award is one usually given to outstanding foreigners.

Kermit G. Rowley, area engineer with Mobil Oil Co. in Pettus, Tex., has been promoted to production foreman in Robstown, Tex.

Dr. Roberto Sarmiento, who has been on temporary assignment as section head of Jersey Production Research Co.'s geophysical-interpretation section, has been named head of the logging-research section, drilling and development division. **P. J. Jacobsen,** formerly with Creole, will move to Tulsa October 1 as head of the geophysical-interpretation section.

Glenn T. Newkirk and **P. G. Cooper** have joined the process division of Gulf Research & Development Co. in Pittsburgh.

Lindsay I. Griffin, Jr., assistant director of the Esso research laboratories at Humble Oil & Refining Co.'s Baton Rouge refinery, has been given a rotational assignment with Esso Research & Engineering Co. in Linden, N. J. He will work with fuel-cell development in the product-research division there. **E. D. Luallin,** engineer in the Baton Rouge laboratories, has been transferred to the chemical technical service department. **M. R. Lay,** division foreman in the lubricants and wax department at Baton Rouge, has been named division foreman, refining division. He succeeds **A. A. Randolph,** who will retire December 1.

Hans G. Schmid has been transferred from Shell Chemical Corp.'s Norco, La., plant to the technical service laboratory in Union, N. Y., as a chemist in the industrial chemicals department.

W. M. Horn, scout with Gulf Oil Corp., has been transferred to Salt Lake City from Billings, Mont. He succeeds **Steve Chamberlain,** who has resigned.

C. E. Farnsworth, product manager, plastics, for Enjay Chemical Co. division of Humble Oil & Refining Co., has been named head of Enjay's new plastics and resins division. **G. W. Miller** has been named assistant manager, plastics and resins division.

R. R. Ruth, scout for Shell Oil Co. in Amarillo, Tex., has been named district scout in Lexington, Ky.

A. C. Pierce will join Jersey Production Research Co. September 19 as a section head in the geological research division. He will succeed **Dr. A. L. Kidwell,** who has taken a 6-month assignment as assistant to the geological research division manager. Pierce was with Creole Petroleum Corp. as head of regional studies at Maracaibo before the appointment with Jersey Production Research.

Francis J. Sitek has been named manager of operations in the marketing division of California Oil Co., a new position.

John S. Rodgers, intermediate petroleum engineer with Sinclair Oil & Gas Co.'s production department in Tulsa, has been transferred to the West Texas division at Midland, Tex. **Julius Tollas,** junior petroleum engineer in Midland, has been promoted to intermediate petroleum engineer. **Dale K. Rittenhouse,** junior geologist in Midland, has been promoted to intermediate geologist. **Douglas W. Cunningham,** junior petroleum engineer in the Andrews, Tex., district, has been transferred to Midland. **Marshall E. Ewing,** junior petroleum engineer in Hobbs, N. M., has been transferred to Andrews.

New appointments as marketing division manager in Gulf Oil Corp.'s southwestern marketing region have gone to **E. J. Golaz,** division manager in Houston; **Bernie Willoughby,** manager in Fort Worth; **R. G. Renaudin,** manager in New Orleans; and **M. C. Enright,** manager in Tulsa. The new division offices are being set up as part of Gulf's marketing organization realignment. Golaz has been manager of the Houston marketing district. Willoughby was district manager in Louisville; Renaudin was New Orleans manager of retail and jobber sales; and Enright was manager of retail and jobber sales in Houston.

John Kavanagh, district land man for Sinclair Oil & Gas Co., has been transferred to Wichita from Bismarck, N. D.

R. M. Griswold has been named sales supervisor in Shell Oil Co.'s Wilmington, Calif., marketing district. He succeeds **A. T. Kelsey,** who has been promoted to commercial manager of the Los Angeles division.

Three Sinclair Refining Co. vice presidents have been elevated to executive vice presidents in charge of the company's three main divisions.

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ISCHIE

COOPER

They are **L. J. Hoar,** executive vice president and director of marketing; **Robert E. Howe,** executive vice president and coordinator, petrochemicals and research; and **W. Vaughn Ischie,** executive vice president and director of manufacturing. Also, **R. M. Cooper** has been elected vice president, a director, and general manager of refineries. **E. W. Griscom,** vice president, has been named director of transportation, supply, and distribution, and **G. G. Welling,** vice president, has been named general manager of transportation, supply, and distribution.

Personals

Monty G. Martin, chief geologist, Texas Gas Transmission Corp., has been appointed manager of gas reserves. Martin will be responsible for estimation of all company gas reserves, estimation of gas reserves under proposed contracts, and for studies of drilling activity in the company's gas-supply area. Martin was with Southwest Natural Production Co. before joining Texas Gas in 1952.

J. V. Davidson, sales supervisor in Tacoma, Wash., for Shell Oil Co., has been named San Bernardino, Calif., marketing district sales manager. He succeeds **J. P. Crangle,** who has been promoted to district sales manager in Tacoma.

C. D. Mims, vice president of production for Standard Oil Co. of Texas in Houston, has been transferred to the staff of the vice president, exploration and production, of Standard Oil Co. of California, the parent company. He will headquarter in San Francisco. **Vern L. Taylor,** now on the exploration and production staff of California Standard, will succeed Mims in Houston.

Frank Gaines, Jr., production manager of the eastern area of Humble Oil & Refining Co.'s Carter division in Mattoon, Ill., has been named coordinator of executive development and organization planning in Humble's headquarters office, Houston. **Hugh H. Goerner,** assistant to the production manager in the Carter division's Tulsa office, will succeed Gaines in Mattoon. The appointments are effective October 1.

Chaplin Tyler, Du Pont, has received the 1960 award of merit of American Association of Cost Engineers. The award recognizes his contributions to cost-engineering economics, analysis and its application to the chemical-process industries.

T. M. Martin, vice president and a director of Monsanto Chemical Co. and president of the Lion Oil Co. division, has retired. Martin became vice president of Monsanto after the Lion-Monsanto merger in 1955. He had been president of Lion since 1947. He has served on Monsanto's executive committee since 1958.

A. J. Johnson, vice president of the development and engineering division of Shell Development Co.'s Emeryville, Calif., research center, will become vice president in the company's head office in New York about the first of the year. At the same time, **T. W. Evans,** vice president, research, will become vice president and general manager of the Emeryville research center.

C. Kenneth Beach, director of management development for Arabian American Oil Co., has been named director of training in the general office, Dhahran. **Robert G. Williams,** general auditor, will succeed Beach. **Lauren E. Chandler,** comptroller, Aramco Overseas Co., The Hague, will take Williams' post. **G. E. McSweeny,** acting director of training, has been named assistant director of training.

John B. Vallely, production superintendent for Reserve Oil & Gas Co., and **G. Gary Brown,** reservoir engineer for Reserve, have formed Vallely & Brown, petroleum consulting firm in Bakersfield, Calif. The company will specialize in production and reservoir work.

J. C. (Jack) Pasley, manager of supply and distribution for DX Sunray Oil Co., has retired after 40 years with DX and predecessor companies. He had been head of the supply and distribution department since 1946.

S. M. Anderson, Jr., has joined King-Stevenson Oil Co., Inc., as manager of the southwestern division which includes Oklahoma, Kansas, Arkansas, Louisiana, and Texas.

Deaths

Walker Lewis Taylor, 70, the man who directed exploration resulting in Alberta's Leduc discovery in 1947, died recently. Taylor was western Canada production manager for Imperial Oil Ltd. at the time of the Leduc discovery, which triggered western Canada's great oil boom. After Leduc, Taylor was named general manager of Canadian exploration and production for Imperial in Toronto. He held this post when he retired in 1953 after 34 years with the company.

C. E. Murray, 79, Bartlesville, Okla., retired vice president and secretary of Cities Service Oil Co., died August 29 in Pleasanton, Kans. Murray retired in 1951 after 48 years with Cities Service and its affiliates. He had been a vice president since 1937.

Jack M. Jessen, 55, Los Angeles attorney who specialized in legal problems of the petroleum industry, died August 26 in an Arcadia, Calif., hospital. Jessen, a partner in Dolley, Jessen & Painter, played a part in the 1955 negotiations which opened Yemen to U. S. oil firms. He was with the old General Petroleum Corp. before going into private practice.

Harry A. Feldbush, 67, retired vice president in charge of engineering for Worthington Corp., died August 28 at his Short Hills, N. J., home. Feldbush joined Worthington in 1915. He was elected a vice president in 1945 and retired in 1958.

Samuel Clyde Carney, 76, retired Phillips Petroleum Co. engineer, died August 26 at his home in Tulsa after a heart attack. Carney was with Shell Oil Co. before joining Phillips. He also was a consultant for several years.

Roy G. Hemminghaus, 52, vice president of new product planning for Chemstrand Corp., died August 25 in a Ridgewood, N. J., hospital after a brief illness. Hemminghaus was with Monsanto Chemical Co. before joining Chemstrand in 1950. He had been vice president and general manager of manufacturing and vice president, staff services, for Chemstrand.

Fred M. Oderkirk, 78, engineer with the old Carter Oil Co., died August 25 in a Tulsa hospital. He had been ill for several years. Oderkirk retired in 1947 after 29 years with Carter.

John Fertig Millikin, 92, retired Los Angeles independent producer, died August 26 at his home in Los Angeles. Millikin was active in the Los Angeles area for 40 years before his retirement in 1950.

Noah F. Wright, 65, who retired June 1 as manager of income and excise taxes for Sunray Mid-Continent Oil Co., died August 27 at his home in Tulsa.

Charles Ray Bagwell, 39, Tidewater Oil Co. land man in Oklahoma City, died August 28 in a Tulsa hospital.

speaking
You are looking at the largest barge of its kind ever constructed. It is one of two independent pressure tank barges built by Avondale Shipyards, Inc., for the Union Texas Natural Gas Corporation of Tulsa, Oklahoma.
Measuring 273' x 41' x 12' 6", the open hopper barge contains four saddle mounted independent cargo tanks each 112' 9½" in length and 16' 3⅜" in diameter. Each pressure tank has liquid capacity of 165,000 gallons, for a total barge capacity of 660,000 gallons.

(Continued from page 230)

currently drilling 1 Oscar, an offset to Sunshine's 1 Medina.

While the amount of oil and gas recovered on initial tests of the 1-A Rayonier is old hat for the area, the encouraging factor is that in the 580-ft. zone between 3,420-4,000 ft. approximately 220 ft. of the zone is sand. This net sand thickness and potentially productive zone, when compared with the 20-30 ft. zones in Sunshine's 1 Medina, is a large part of the reason for the current interest in the area.

Flank test due for Gulf Coast well

In Liberty County, Texas Gulf Coast, Shell Oil Co. will drill a 14,000-ft. flank test on the southeast side of prolific Rich Ranch field.

The 1 Eli Rich will be drilled 3½ miles south of Raywood on the E. Miller Survey, A-910. Location is 2,650 ft. southwest of the 1 Bill Daniel oil discovery of the field. Field discovery well was completed in July 1959 through Y-3 Yegua perforations at 11,085-89 and 11,105-27 ft. for 345 bbl. of oil per day. Gas-oil ratio was 2,544:1, gravity 49°. The confirmation well was completed last October. It flowed 306 bbl. of oil per day from 11,140-88 ft. When this well was completed, Shell drilled two dry holes on the northwest side of the field. The new test will try to extend Yegua production southwest.

Discovery wells

ARKANSAS

Sebastian County:

Arkansas Louisiana Gas Co. 2 Curtis Wright, 36-9n-30w, ¾ mile northwest of Island. IP 450 M.c.f.d., ⅜-in., TP 120 psi., perf. 2,051-82 ft., Alma sand. TD 5,105 ft. Extends Cecil field.

Union County:

Kinsey & Kinsey et al. 1 Trull, SE NE SE 27-18s-14w. IPP 459,443 cu. ft. of gas per day, 10 BC per M.M.c.f., 10/64-in., TP 1,640 psi., perf. 4,397-4,400 ft., Hogg sand. TD 5,208 ft. New pay in Olin Forest field.

CALIFORNIA

Sutter County:

Cameron Oil Co. and Franco Western Oil Co. 1 Helen McLaughlin, NE SW 5-14n-1e, IP of 33,020 M.c.f.d. from six zones, perforations in upper zone at 6,924-94 ft., perforations in lower zone at 7,307-55 ft., 7,404-34 ft., and 7,467-79 ft., TD 8,500 ft. (Deeper pool discovery in Grimes field.)

NORTH LOUISIANA

Catahoula Parish:

H. A. Harper 1 Beasley, 35-9n-6e. IP 51 BOPD, 6/64-in., 42°, GOR 200 cu. ft. per bbl., TP 385 psi., perf. 4,304-5 ft., Wilcox. TD 5,206 ft. Discovery well of Wallace Ridge field.

McGoldrick & Watson Drilling Co. and R. H. A. Alagood 1 J. A. McMillan, 15-8n-6e, 2¾ miles northwest of Jonesville. IP 209 BOPD, 8/64-in., 41°, TP 25 psi., perf. 4,371-72 ft., Wilcox (Tew Lake sand). TD 5,077 ft. Discovery well of Wallace Lake field.

Concordia Parish:

E. C. Wentworth 1-E Fisher, 2-7n-7e, 1¼ miles northeast of Moro. IPP 5 BOPD, 27°, perf. 3,737-45 ft., Wilcox (Stewart "A" sand). TD 3,857 ft. New-field discovery.

Marlin Exploration, Inc., 1 Concordia Parish School Board, 64-2n-8e, 3½ miles southwest of Shaw. IPP 106 BOPD, 8/64-in. 43.3°, GOR 400 cu. ft. per bbl., TP 310 psi., perf. 5,923-26 ft., Wilcox. TD 8,512 ft. Discovery well of Lost Lake field.

Winn Parish:

L. S. T. Oil Co. 1 Fannie Long, NW NE NW 26-11n-1w. IPP 28 BOPD, 20.6°, perf. 1,329½-51 ft., Wilcox. TD 1,351 ft. Extends Colgrade field 1¾ miles southeast.

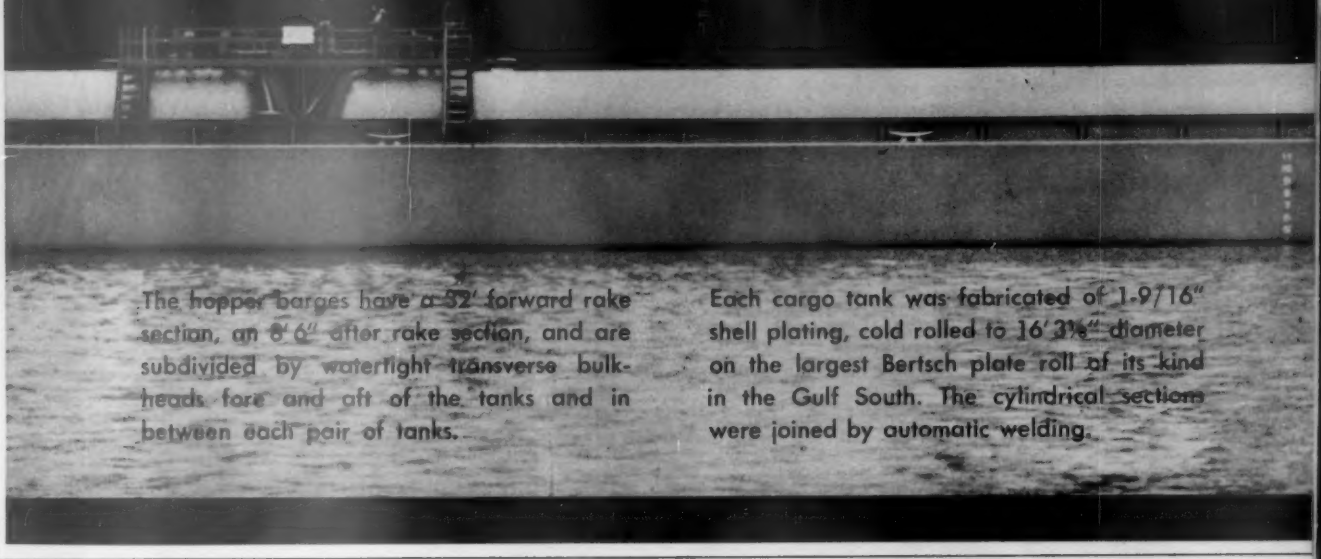
S. W. Ray et al. 1 Lavespere, 17-10n-1e. IP 33 BOPD, 12/64-in., 20.6°, TP 125 psi., open hole 1,456-66 ft., Wilcox. TD 1,466 ft. Extends newly opened Salt field 1 mile northeast.

SOUTH LOUISIANA

Allen Parish:

H. L. Hunt 1-C Crosby Chemicals, 33-5s-7w. IP 131.52 BOPD, 7/64-in., 48.2°, GOR 740 cu. ft. per bbl., TP 1,100 psi., perf. 8,750-54 ft. TD 9,450 ft. Extends Clear Creek field ¾ mile north at east end.

# of big bar



The hopper barges have a 52' forward rake section, an 8' 6" after rake section, and are subdivided by watertight transverse bulkheads fore and aft of the tanks and in between each pair of tanks.

Each cargo tank was fabricated of 1-9/16" shell plating, cold rolled to 16' 3⅛" diameter on the largest Bertsch plate roll of its kind in the Gulf South. The cylindrical sections were joined by automatic welding.

St. Bernard Parish:
Humble Oil & Refining Co. 1 State Lease 3668-Lake Fortuna. IP 89 BOPD, ⅛-in., 30.6°, GOR 1,112 cu. ft. per bbl., TP 475 psi., perf. 7,144-50 ft. TD 9,070 ft. New pay and extension in Lake Fortuna area.

Vermilion Parish:
Trice Production Co. 4 L. M. Wise, 62-13s-3e. IP 189 BOPD, 8/64-in., 55°, GOR 336 cu. ft. per bbl., TP 1,375 psi., perf. 8,797-8,800 ft. TD 10,868 ft. New pay in Bancker field.

NEW MEXICO

Eddy County:
Ralph Lowe 2 Poker Lake Superior, 8-25s-30e., 10 mile southeast of Malaga. IPCAOF 1,788 M.c.f.d., ¾-in. choke, Delaware 3,698-3,706 ft. TD 3,750 ft. New gas discovery.

Shell Oil Co. 1 Henshaw Deep unit, 10 miles northeast of Maljamar in 24-16s-30e. IPF 77 BOPD. 3 M.M.c.f.d., 24/64-in. choke, 54.5°, GOR 38,961:1, TP 1035 psi., packer, Devonian 11,-680-90 ft. TD 13,027 ft. PBTD 11,770 ft. New oil discovery.

John H. Trigg 1-5 Federal (PV) 10 miles northwest of Maljamar in 5-16s-31e. IPF 49 BOPD, ⅝-in. choke, 36°, TP 250 psi., CP 100 psi., Premier 3,441-47 ft. TD 3,483 ft. New oil discovery.

Gordon M. Cone 1 Gorman State, 15 miles southwest of Artesia in 36-18s-24e. IPF 54 BOPD, 10/64-in. choke, 44.5°, TP 75 psi., packer, Wolfcamp 5,741-53 ft. TD 6,100 ft. PBTD 5,814 ft. New oil discovery.

Lea County:
Cabeen Exploration Corp. 1-K State, 7 miles northeast of Caprock in 11-10s-32e. IPF 364 BOPD, 24/64-in. choke, 43.1°, TP 857 psi., packer, Wolfcamp 8,354-8,771 ft. TD 10,800 ft. New oil discovery.

San Juan County, Largo:
Skelly Oil Co. 7 John Charles, SE SW 13-27n-9w. IPF Mesaverde 3,300 M.c.f.d., ¾-in. choke, SITP 1,114 psi.; SIPT 2,055 psi. Mesaverde 4,290-4,385 ft., Dakota 6,374-6,480 ft. Dual completion. TD 6,680 ft. Dakota discovery, new pool.

EAST TEXAS

Anderson County:
Concho Petroleum Co. et al. 1 Southern Pine, L. McCann Sur., A-880, 7 miles southeast of Palestine. IP 147 BOPD, 11/64-in., 38°, GOR 659 cu. ft. per bbl., TP 430 psi., perf. 5,535½-37 ft., Woodbine. TD 5,552 ft. Discovery well Lake Mary field.

WEST TEXAS

Crane County:
Abell field. Bell Petroleum Co. 3 W. O. Rehmeyer, Sec. 14, Blk. 1, H&TC Sur. IPP 66 BOPD, 40°, Ellenburger open hole at 5,630 ft. TD 5,655 ft. New oil discovery.

Dawson County:
Texas National Petroleum Co. 1 R. F. Jackson, 7 miles southeast of Lamesa in Sec. 7, Blk. 34, T-5-N, T&P Sur. IPP 60 BOPD, plus 60% water, 40.2°, GOR 912:1, Spraberry 7,010-16 and 7,035-70 ft. TD 8,928 ft. New oil discovery.

Ector County:
OWWO. Texaco Inc. 27 Ida McDonald, Sec. 27, Blk. B-16, PSL Sur. IPP 102 BOPD, plus 42% water, 41.6°, Fusselman 7,494-7,519 ft. IPP 69 BOPD, plus 44% water, 41.3°, GOR 1,132:1, Wolfcamp 6,695-6,732 ft. TD 7,537 ft. New oil discovery.

Glasscock County:
James R. Currie 1 TXL, Currie, Nolan & Shaeffer, Sec. 39, Blk. 32, T-4-S, T&P Sur. IPP 265 BOPD, 32°, Permian open hole at 2,736 ft. TD 2,739 ft. New oil discovery.

Nolan County:
Sherwood B. Owens 1 C. W. Tipton, Sec. 43, Blk. 19, T&P Sur. IPF 262 BOPD, 24/64-in. choke, TP 165 psi., 43°, GOR 850:1. Strawn 5,120-28 and 5,141-45 ft. TD 5,186 ft. New oil discovery.

Pecos County:
Southern Minerals Oil Corp. et al. 1 Jasper CSL, Sec. 1, Blk. 104, Jasper CSL. IPF 165 BOPD, plus 2% water, ½-in. choke, 31.8°, GOR 1,542:1, TP 60 psi. packer, Clearfork 6,080-6,115 ft. TD 10,644 ft. New oil discovery.

WEST CENTRAL TEXAS

Haskell County:
Tom B. Meddrs 1 Ira Gringstead, 1 mile east of Rochester in Subd. 40, Red River CSL Sur. 75. IPP 229 BOPD, 38°, GOR 400:1, Jud sand 4,849-53 ft. TD 4,895 ft. New oil discovery.

Matagorda County:
J. M. Huber Corp. 1-B Huebner, Peter Bertrand Sur., A-5, 3 miles southwest of Bay City. IP 43.84 BOPD, 12/64-in., 35.8°, GOR 16,971 cu. ft. per bbl., TP 1,360 psi., perf. 8,936-42 ft., Frio. TD 10,909 ft. New pay in West Lucky field.

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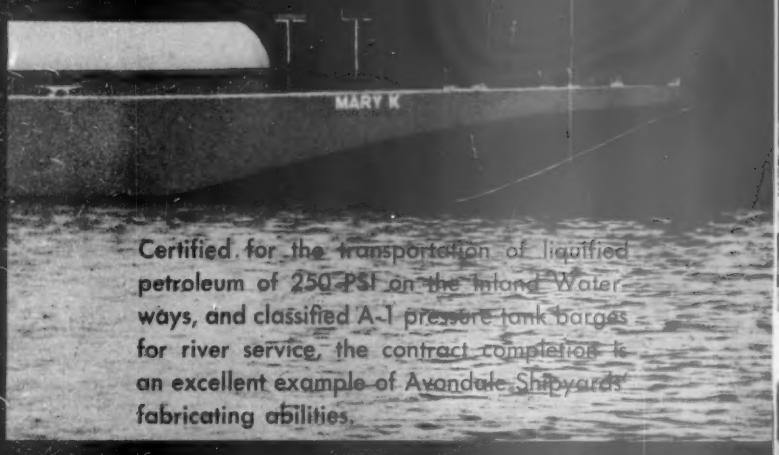


Certified for the transportation of liquified petroleum of 250-PSI on the Inland Waterways, and classified A-1 pressure tank barges for river service, the contract completion is an excellent example of Avondale Shipyards' fabricating abilities.

The economies being effected today through the movement of petrochemical products by water are of prime profit importance. And important to your expansion into this area is the selection of a barge builder. Avondale Shipyards offers years of specialized experience, complete design, engineering and fabricating facilities, proof of ability through the hundreds of highly successful Avondale-built petrochemical barges now operating for many companies.

Cold rolling 1-9/16" steel plate to form a 16' 3⅛" dia. pressure tank section. Bertsch roll capacity is 4½", largest of kind in Gulf-South.

Tank sections being fabricated in one of Avondale's structural shops.

Foreground, pressure tank nearing completion on aligning platten, background, left, completed tank being stressed relieved in Avondale's 18' x 18' unlimited length stress relieving furnace.

One of four 165,000 gallon cargo tanks being lowered into saddles in barge hull. Lifting device (not shown) has 600-ton capacity.

AVONDALE SHIPYARDS, INC.

FORMERLY AVONDALE MARINE WAYS, INC.

P. O. BOX 1030 • PHONE UNiversity 6-4561 • NEW ORLEANS 8, U.S.A.

Distillate sales are lagging

BY JOHN C. CASPER

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,850,190	DOWN	9,640	UP	77,800
Crude stocks	238,308,000	DOWN	371,000	DOWN	15,045,000
Completions	983	UP	116	DOWN	30
Refinery runs	8,172,000	UP	37,000	DOWN	190,000
Gasoline stocks	190,680,000	DOWN	1,414,000	UP	7,598,000
Kerosine stocks	32,327,000	UP	959,000	UP	1,283,000
Distillate stocks	148,966,000	UP	5,135,000	DOWN	10,575,000
Residual stocks	45,309,000	UP	995,000	DOWN	11,140,000
Four-product stocks	417,282,000	UP	5,675,000	DOWN	12,834,000
Total imports	1,468,900	DOWN	159,400	UP	144,000

SALES OF HEATING DISTILLATES AND RANGE OILS

(Thousands of barrels)

	1957	1958	1959	% gain 1958 over 1957	% gain 1959 over 1957
District 1—					
Connecticut	19,191	25,391	23,107	32.31	20.41
Delaware	3,208	2,963	3,074	− 7.64	− 4.18
District of Columbia	3,534	3,167	2,528	−10.38	−28.47
Florida	4,350	5,407	6,095	24.30	40.11
Georgia	3,147	3,015	2,118	− 4.19	−32.70
Maine	8,103	8,106	8,541	0.04	5.41
Maryland	15,780	15,483	11,617	− 1.88	−26.38
Massachusetts	41,553	52,378	45,052	26.05	8.42
New Hampshire	5,964	5,231	4,785	−12.29	−19.77
New Jersey	34,564	37,394	51,020	8.19	47.61
New York	63,215	75,083	70,889	18.77	12.14
North Carolina	14,102	18,548	17,849	31.53	26.57
Pennsylvania	32,190	35,078	34,835	8.97	8.22
Rhode Island	6,959	8,816	7,780	26.68	11.80
South Carolina	5,512	6,598	6,794	19.70	23.26
Vermont	2,107	3,521	3,042	67.11	44.38
Virginia	10,876	10,995	12,209	1.09	12.26
West Virginia	717	414	477	−42.26	−33.47
Total Dist. 1	275,072	317,588	311,812	15.46	13.36
District 2—					
Illinois	26,386	35,065	32,853	32.89	24.51
Indiana	12,380	18,075	18,884	46.00	52.54
Iowa	9,604	8,516	10,601	−11.23	10.38
Kansas	2,548	1,580	1,363	−37.09	−46.51
Kentucky	2,473	2,168	3,126	−12.33	26.41
Michigan	24,667	26,740	28,354	8.40	14.95
Minnesota	15,373	12,569	11,671	−18.24	−24.08
Missouri	7,917	9,677	7,877	22.23	− 0.51
Nebraska	3,644	2,673	2,331	−26.65	−36.03
North Dakota	2,813	2,085	3,084	−25.88	9.6
Ohio	11,575	12,939	13,963	11.78	20.63
Oklahoma	1,038	423	348	−59.25	−66.47
South Dakota	2,552	2,214	2,621	−13.24	2.70
Tennessee	2,312	1,624	2,086	−29.76	− 9.78
Wisconsin	15,188	16,943	17,866	11.56	17.63
Total Dist. 2	140,470	153,291	157,028	9.13	11.79
District 3—					
Alabama	1,353	945	712	−30.16	−47.38
Arkansas	944	248	106	−73.73	−88.77
Louisiana	1,238	884	1,061	−28.59	−14.30
Mississippi	745	333	55	−55.30	−26.18
New Mexico	337	258	163	−23.44	−51.62
Texas	3,361	3,693	3,174	9.88	− 5.56
Total Dist. 3	7,978	6,361	5,271	−20.27	−33.93
District 4—					
Colorado	1,049	861	895	−38.89	−36.48
Idaho	2,091	2,171	2,238	3.83	7.03
Montana	1,282	723	1,464	−43.60	14.20
Utah	1,243	901	645	−27.51	−48.11
Wyoming	645	328	318	−49.15	−50.70
Total Dist. 4	6,670	4,984	5,560	−25.28	−16.64
District 5—					
Alaska	.....	.....	1,601	.....	.....
Arizona	240	290	361	20.83	50.42
California	3,537	3,236	3,521	− 8.51	− 0.45
Nevada	495	455	462	− 8.08	− 6.67
Oregon	5,825	5,039	5,649	−13.49	− 3.02
Washington	12,407	10,718	11,989	−13.61	− 3.37
Total Dist. 5	22,504	19,738	23,583	−13.29	4.79
Total U. S.	452,694	501,962	503,254	10.88	11.17

MARKETERS on the East Coast account for better than 60% of distillate heating-oil sales in this country, but the growth rate for the area seems to be slowing down.

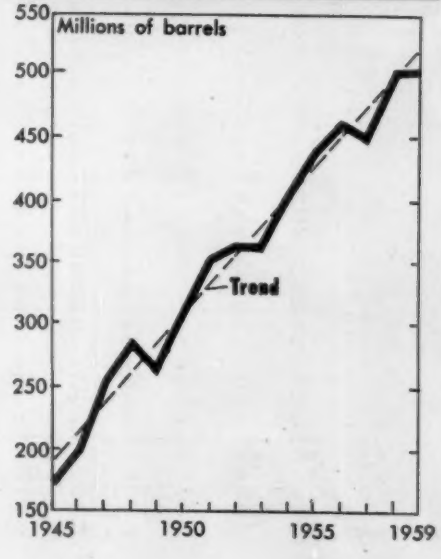
There have been two decreases in annual sales for the district out of the past 3 years. The average annual gain for these years has been only about 4%. Part of this lag can be charged to the weather, but some of the slowdown was due to competition from natural gas. Residential and commercial sales of natural gas in District 1 have been gaining steadily, even in 1957 when distillate use was off 1.5%.

Since District 1 sales account for such a large portion of total distillate demand, any slowdown on the East Coast has a pronounced effect on the national total.

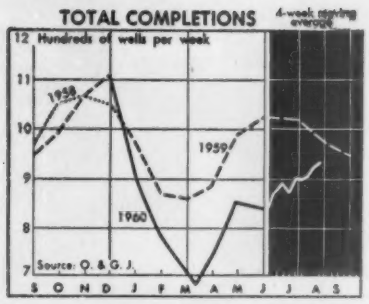
Figures for the table and chart are from Bureau of Mines reports on sales of fuel oil and kerosine. State totals include distillate for heating plus kerosine and No. 1 fuel sold as range oil.

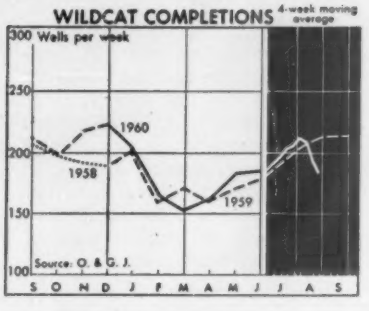
For the country as a whole, there was only a small gain of 1,292,000 bbl. in 1959 but a large increase of 49,268,000 bbl. in 1958. Note that the point for 1958 lies almost on the trend line, indicating a near-normal year. Sales for both 1957 and 1959 fell well below the trend line.

Sales of Heating Distillate and Range Oil in U.S.



DRILLING





Active Rotary Rigs

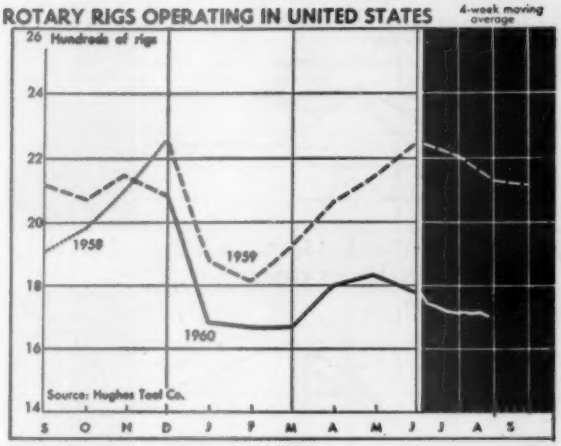
	8-29-60	8-22-60	8-31-59
Alabama	5	4	9
Alaska	7	7	(†)
Arkansas	11	13	14
Arizona	1	1	2
California	86	82	100
Land	85	81	94
Offshore	1	1	6
Colorado	47	44	57
Florida	2	2	1
Land	2	2	1
Offshore	0	0	0
Illinois	41	39	44
Indiana	8	11	9
Iowa	0	0	2
Kansas	102	112	130
Kentucky	3	3	8
Louisiana	266	291	334
North	27	38	39
S. Inland waters	107	112	135
S. Land	74	78	108
Offshore	58	63	52
Maryland	1	1	0
Michigan	32	45	31
Mississippi	50	56	69
Missouri	1	1	0
Montana	25	24	30
Nebraska	16	19	29
Nevada	0	0	1
New Mexico	112	112	120
New York	1	0	0
North Dakota	12	14	27
Ohio	6	3	3
Oklahoma	163	157	203
Oregon	1	1	0
Pennsylvania	10	9	11
South Dakota	2	0	9
Tennessee	2	1	0
Texas	562	560	748
S. Inland waters	2	2	5
S. Land	178	171	198
Offshore	1	0	2
North	45	45	184
Panhandle	44	42	(*)
East	42	48	(*)
West Central	144	145	235
West	106	107	124
Utah	28	30	33
Washington	1	1	2
West Virginia	5	5	8
Wyoming	59	62	73
Total U. S.	1,668	1,710	2,107
Western Canada	159	172	136
Eastern Canada	1	0	0
Grand total	1,828	1,882	2,243

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

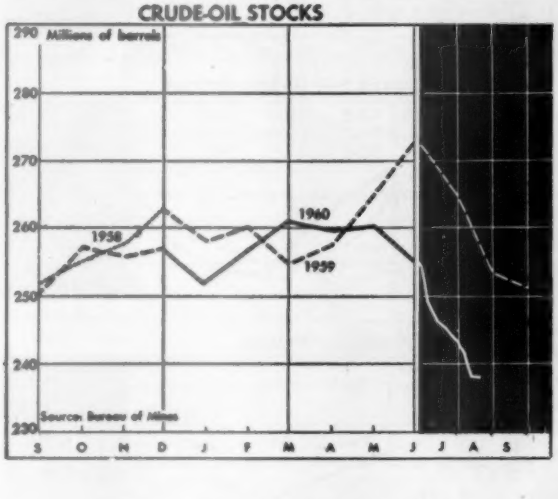
WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 27, 1960

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	1	1	0	0	0	0	11,604	32	63	0	0	0	0	0	2	16
Arizona	0	0	0	0	0	0	0	25	.....	0	0	0	0	0	18	.....
Arkansas	15	6	0	3	6	0	45,842	394	551	6	0	0	2	4	110	96
California	32	21	0	1	10	0	149,246	1,080	992	8	0	0	0	8	205	248
Colorado	11	1	0	2	8	0	54,763	410	502	6	0	0	0	6	206	300
Illinois	70	25	0	0	33	12	185,032	1,432	1,455	15	0	0	0	15	303	241
Indiana	25	7	0	1	17	0	34,740	653	538	11	3	0	0	8	243	178
Kansas	156	74	0	9	66	7	385,014	2,205	2,647	19	0	0	2	17	678	627
Kentucky	64	6	0	1	6	51	59,971	1,227	1,614	1	1	0	0	0	118	143
Louisiana	67	35	6	2	24	0	525,535	2,285	2,415	10	1	0	0	9	360	326
North	23	10	0	2	11	0	91,937	848	907	5	1	0	0	4	174	138
South	33	20	1	0	12	0	308,288	1,107	1,253	5	0	0	0	5	163	175
Offshore	11	5	5	0	1	0	125,410	330	255	0	0	0	0	0	23	13
Michigan	22	9	0	5	8	0	84,183	576	413	4	0	0	0	4	152	103
Mississippi	14	3	0	0	11	0	132,856	452	410	8	0	0	0	8	172	187
Montana	8	4	0	0	4	0	37,003	196	210	2	0	0	0	2	93	63
Nebraska	21	8	0	1	11	1	99,871	581	581	6	0	0	0	6	236	250
New Mexico	34	20	1	5	8	0	175,008	1,215	1,342	5	0	0	0	5	118	159
West	15	6	1	5	3	0	81,540	402	609	3	0	0	0	3	45	44
East	19	14	0	0	5	0	93,468	813	733	2	0	0	0	2	143	115
New York	0	0	0	0	0	0	0	205	172	0	0	0	0	0	26	16
North Dakota	4	1	0	0	3	0	18,598	196	326	2	0	0	0	2	52	61
Ohio	30	17	0	8	5	0	77,297	663	643	1	0	0	0	1	35	21
Oklahoma	56	18	0	5	21	12	231,972	3,010	3,789	18	2	0	3	13	493	564
Pennsylvania	0	0	0	0	0	0	0	440	335	0	0	0	0	0	8	9
South Dakota	0	0	0	0	0	0	0	17	.....	0	0	0	0	0	6	.....
Texas	291	152	21	11	102	5	1,244,894	10,359	12,604	56	5	0	0	51	2,137	2,371
District 1	18	8	0	0	10	0	35,637	713	749	8	0	0	0	8	267	214
District 2	21	5	1	4	11	0	125,792	497	526	7	0	0	0	7	123	156
District 3	20	9	4	1	6	0	131,978	800	800	2	0	0	0	2	149	156
District 4	20	5	4	2	9	0	107,387	716	878	5	0	0	0	5	202	218
East	27	21	2	0	4	0	118,032	835	810	3	1	0	0	2	172	156
District 7-B	45	23	0	0	22	0	131,364	1,510	1,736	15	2	0	0	13	438	456
West	68	40	5	1	22	0	384,963	2,716	3,872	10	2	0	0	8	419	541
District 9	53	34	0	0	15	4	116,467	1,890	2,355	6	0	0	0	6	325	401
District 10	19	7	5	3	3	1	93,274	682	878	0	0	0	0	0	42	73
Utah	2	1	0	1	0	0	10,086	167	205	1	0	0	1	0	56	56
West Virginia	31	2	0	28	1	0	77,557	521	511	1	0	0	0	1	5	18
Wyoming	20	9	0	0	9	2	115,360	684	651	8	0	0	0	8	276	222
Misc. (Tenn.)	9	1	0	0	8	0	9,641	103	87	9	1	0	0	8	95	54
Total U. S.	983	421	28	83	361	90	3,766,073	29,128	33,056	197	13	0	8	176	6,273	6,329
Prev. week	867	349	25	62	299	132	3,517,465	.....	.....	148	12	2	3	131	.....	.....
Cum. 1960	29,128	13,323	869	2,378	11,209	1,349	123,952,594	.....	.....	6,273	554	68	202	5,449	.....	.....
Cum. 1959	33,056	16,702	802	2,402	12,294	856	137,300,507	.....	.....	6,329	602	84	196	5,447	.....	.....
Western Canada	50	28	0	6	11	5	265,450	1,518	1,640	9	0	0	2	7	407	466

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-20-60	8-13-60	8-22-59
Pennsylvania	2,348	2,302	2,685
Other Appalachian	1,690	1,710	2,128
Illinois, Indiana, Michigan	9,297	9,247	9,811
Nebraska and North Dakota	2,919	2,914	3,060
Kansas	8,549	8,568	10,005
Oklahoma	16,254	16,324	15,832
Arkansas	1,714	1,805	2,148
Louisiana	17,636	18,232	18,761
North	3,063	3,058	3,283
South	14,573	15,174	15,478
Mississippi, Alabama, Florida	2,320	2,472	2,639
New Mexico	8,727	8,258	7,857
Texas	100,186	99,679	110,569
East Texas	8,056	8,015	8,707
West Texas	47,495	46,921	52,673
Texas Gulf	16,992	16,780	19,202
Other Texas	27,643	27,963	29,987
Wyoming	15,864	16,534	15,787
Other Rocky Mountain	9,364	9,421	10,019
California	26,625	26,819	31,429
Foreign	†14,815	14,394	15,350
Total	**238,308**	238,679	258,080

*Bureau of Mines. †Includes 3,767,000 bbl. in California.

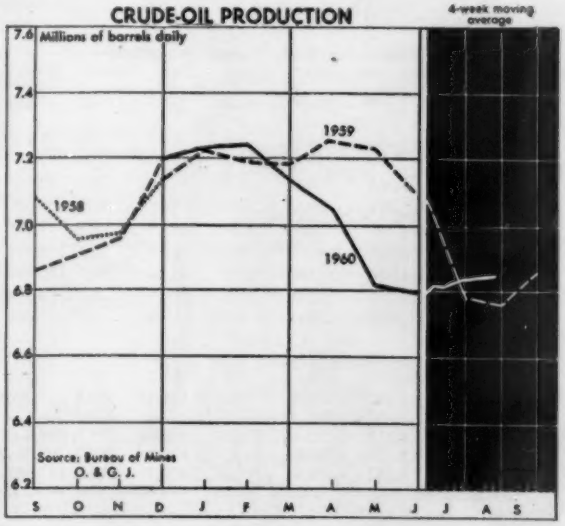
DAILY AVERAGE PRODUCTION FOR WEEK

	August 27, 1960 Crude oil	Lease condensate	Total	Aug. 20 total
Alabama	17,400	.....	17,400	17,000
Arkansas	79,815	185	80,000	82,300
California	833,500	.....	833,500	837,800
Colorado	131,035	.....	131,035	130,275
Eastern	40,800	.....	40,800	39,700
Florida	1,000	.....	1,000	1,000
Illinois	220,200	.....	220,200	218,400
Indiana	31,200	.....	31,200	33,000
Kansas	†305,150	.....	†305,150	†298,040
Kentucky	59,900	.....	59,900	65,600
Louisiana	945,975	120,850	1,066,825	1,066,775
North	105,700	5,850	111,550	111,500
South	840,275	115,000	955,275	955,275
Michigan	41,500	.....	41,500	41,200
Mississippi	131,575	3,450	135,025	135,025
Montana	82,250	.....	82,250	82,000
Nebraska	67,550	.....	67,550	68,200
Nevada	100	.....	100	100
New Mexico	288,275	6,700	294,975	294,975
North Dakota	66,500	.....	66,500	66,800
Oklahoma	†484,400	.....	†484,400	†491,300
Texas	2,352,575	85,250	2,437,825	2,437,825
Dist. 1	41,000	2,500	43,500	43,500
Dist. 2	96,300	8,100	104,400	104,400
Dist. 3	309,275	36,000	345,275	345,275
Dist. 4	164,575	14,450	179,025	179,025
Dist. 5	26,000	300	26,300	26,300
Dist. 6	104,575	9,800	114,375	114,375
East Texas field	122,000	.....	122,000	122,000
Dist. 7-B	127,425	125	127,550	127,550
Dist. 7-C	111,000	3,250	114,250	114,250
Dist. 8	950,425	8,000	958,425	958,425
Dist. 9	193,000	1,800	194,800	194,800
Dist. 10	107,000	925	107,925	107,925
Utah	93,880	.....	93,880	101,740
Wyoming	357,650	.....	357,650	349,250
Others	‡1,525	.....	‡1,525	‡1,525
Total U. S.	6,633,755	216,435	**6,850,190**	6,859,830
Change from prev. week, down	.....	.....	**9,640**	.....
Canada	†529,800	.....	†529,800	†543,905

Total U. S. Prod.—Jan. 1-Aug. 27 ..... 1,678,166,900 bbl.
Same period last year (crude plus cond.) ..... *1,695,186,300 bbl.

*Includes 44,849,250 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

CRUDE-OIL PRODUCTION



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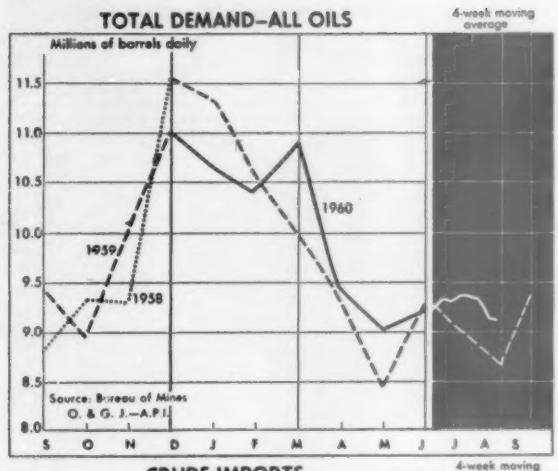

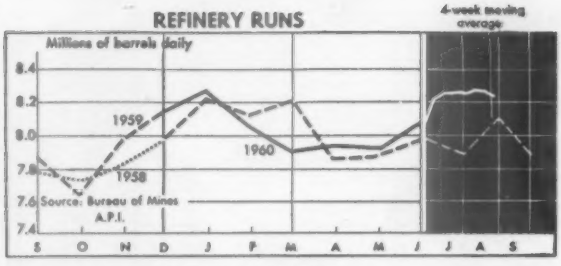

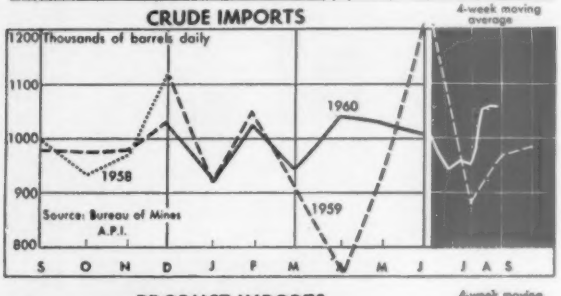

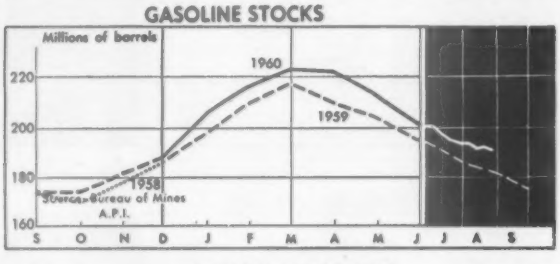

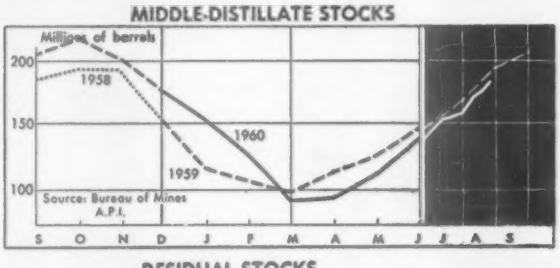

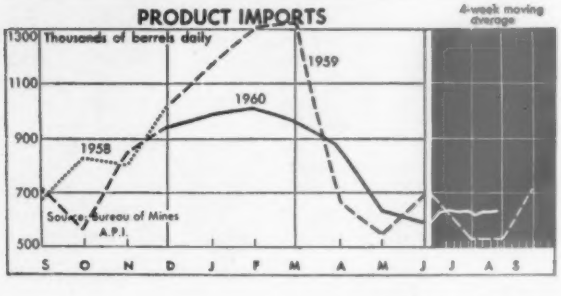

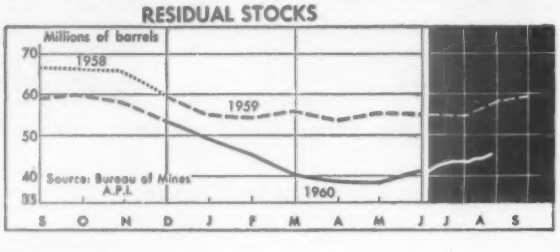

API REFINERY REPORT—AUGUST 26, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1959—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,113	500.4	46.4	294.0	118.3	43,516	12,528	54,970	12,244	1,150	547.8	27.0	328.3	146.8
Appalachian:														
District 1 ...	97	38.7	4.6	21.1	7.3	5,890	745	3,436	447	93	41.2	2.7	21.8	6.0
District 2 ...	109	59.6	2.4	24.3	11.7	3,133	436	1,502	281	105	58.9	1.6	18.8	8.5
Ind., Ill., Ky. ..	1,462	818.1	67.7	302.1	126.3	33,166	6,617	25,757	5,545	1,436	772.0	53.8	298.9	125.2
Minn., Wis., Dak.	129	59.1	3.1	33.0	1.59	6,068	1,570	7,307	618	102	50.7	2.8	27.6	9.9
Okla., Kans., Mo.	769	424.6	15.1	189.9	18.9	17,196	1,812	12,458	1,007	719	393.3	7.0	175.2	18.9
Inland Texas ..	305	236.1	9.7	52.3	22.4	6,671	553	1,664	2,491	306	226.7	7.2	52.0	21.8
Texas Gulf Coast	1,877	995.9	122.8	453.6	120.1	25,452	3,508	15,756	5,096	1,843	958.3	77.3	446.3	168.9
La. Gulf Coast	703	385.1	70.2	155.9	55.3	10,904	1,790	6,773	1,590	717	385.0	48.0	172.3	51.0
N. La. and Ark.	107	76.1	0.7	27.6	6.1	5,208	895	2,177	146	67	27.3	2.0	13.6	5.1
Rocky Mountain:														
New Mexico ..	26	12.6	0.3	4.8	3.4	644	48	151	3	27	14.1	0.4	5.5	2.0
Other Rocky Mt.	313	135.7	3.3	63.3	33.7	5,362	386	2,857	907	318	148.2	2.0	62.9	34.0
West Coast	1,162	470.4	46.0	197.1	353.7	27,470	1,439	14,158	14,934	1,198	542.4	2.5	180.7	285.5
Aug. 26, 1960	8,172	4,212.4	392.3	1,819.0	893.1	190,680	32,327	148,966	45,309	8,081	4,165.9	234.3	1,803.9	883.6
Aug. 19, 1960	8,135	4,209.6	349.3	1,871.0	803.7	192,094§	31,368	143,831	44,314	.....	.....	.....	.....	.....
Aug. 28, 1959	8,362	4,308.9	303.0	1,836.3	905.4	183,082	31,044	159,541	56,449	.....	.....	.....	.....	.....

*At refineries including natural blend. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Revised.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.76	....	....	....	....	....	....	....	....
15-15.9	1.84	....	....	....	....	....	....	....	$1.81
16-16.9	1.92	....	....	....	....	....	....	....	1.86
17-17.9	2.00	....	....	....	....	....	....	....	1.91
18-18.9	2.08	....	....	....	....	....	....	....	1.96
19-19.9	2.16	....	....	....	....	....	....	....	2.01
20-20.9	2.24	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.32	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.39	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

★ **Illinois Basin** **2.85-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.76-1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.74-1.78
- Iranian, 34.0°-34.9°, Abadan 1.69-1.73
- Iraq, 35.0°-35.9°, Fao 1.68-1.74
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi ... 1.58-1.59
- Qatar, 41.0°-41.9°, Umm Said 1.91-1.93

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.13-2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli . 2.15

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 37° 2.57

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Smiley (Sask.) 2.18
- Pembina 2.38

Venezuela:
- Cumarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)
- ★ Gulf-NY, clean (ATRS+10%) $3.14
- ★ Carib.-NY, dirty (ATRS−60%) 1.10
- ★ PG-UK, dirty (Scale−60%) (25s. 5d) .. 3.56
- Gulf-NY, dirty (ATRS−5%) 2.71

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- Regular (91 octane) .. 12.25-12.50
- Premium (99 octane) . 15.00-15.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 11.00
- Regular (92 octane) .. 11.25
- Premium (98 octane) .. 12.25

California (rack) Los Angeles:
- Regular (88 octane) .. 11.65-12.15
- Premium (94 octane) . 12.65-13.15
- Premium (100 octane) 14.00-14.65

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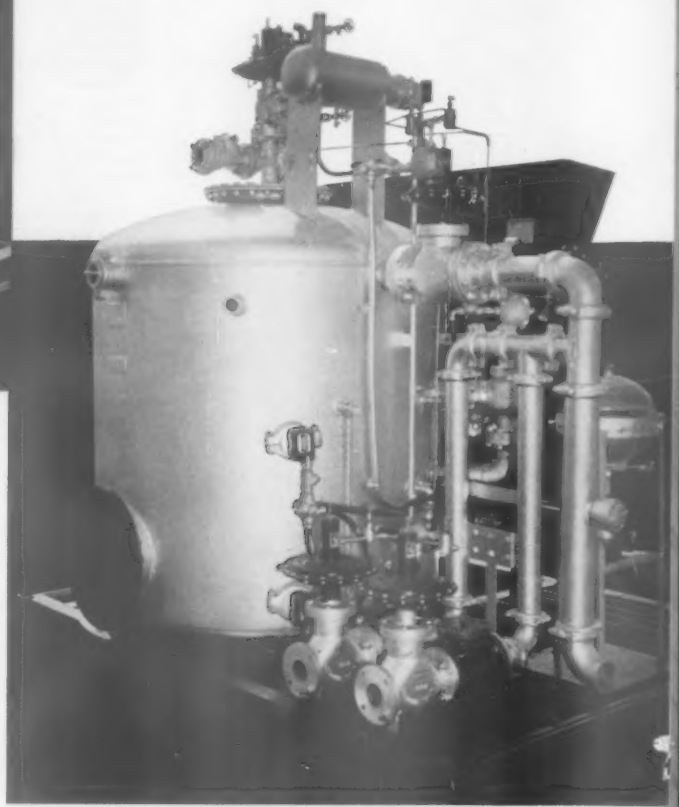

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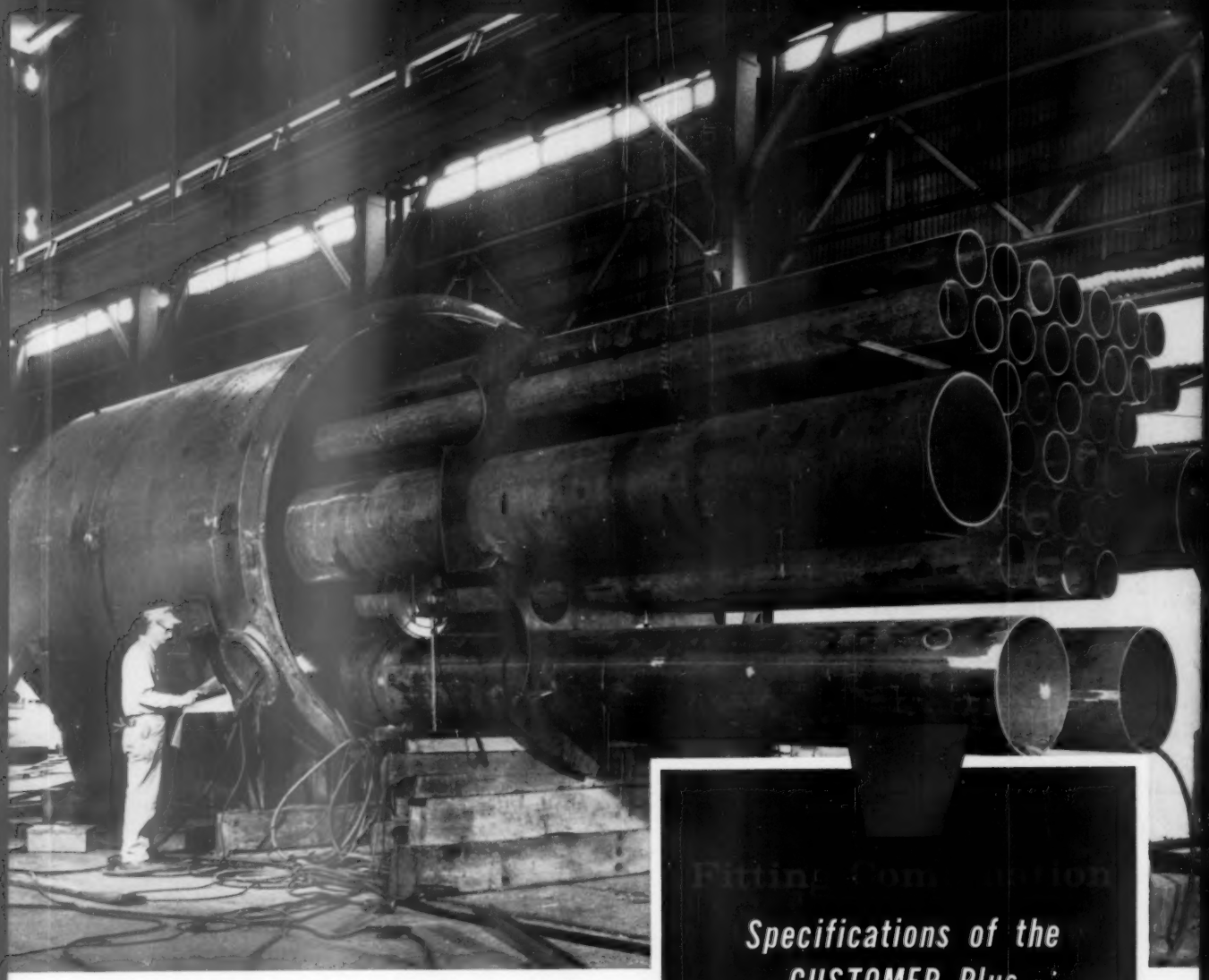

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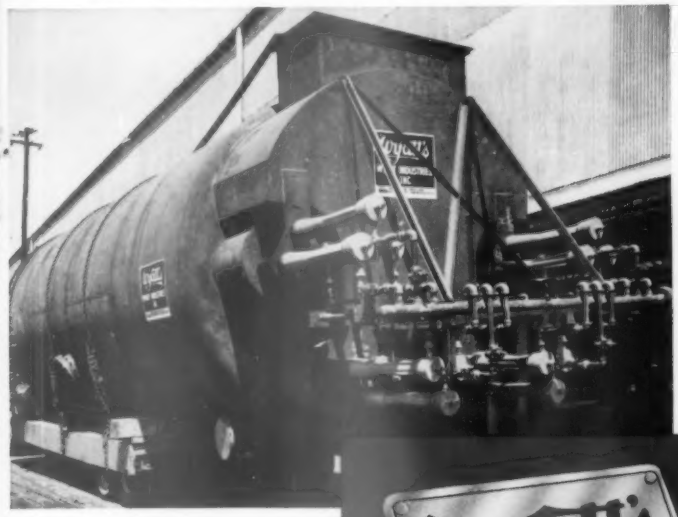
Finished Unit en route to No. 2 Plant of Signal Oil & Gas Company, Houston Division



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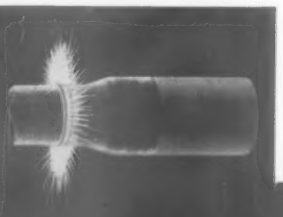

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